85

1985 REGIONAL TRANSPORTATION PLAN

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

1985 REGIONAL TRANSPORTATION PLAN

Commonwealth of Pennsylvania
RAYMOND P. SHAFER,
Governor

State of New Jersey
RICHARD J. HUGHES,
Governor

Pennsylvania Department of Highways

New Jersey Department of Transportation

Pennsylvania State Planning Board

New Jersey Department of Community Affairs

City of Chester
City of Philadelphia
Bucks County
Chester County
Delaware County
Montgomery County

City of Camden
City of Trenton
Burlington County
Camden County
Gloucester County
Mercer County

In Cooperation with
U.S. Department of Transportation,
Federal Highway Administration,
Bureau of Public Roads
and
U.S. Department of Housing and Urban Development

PLAN REPORT No. 5

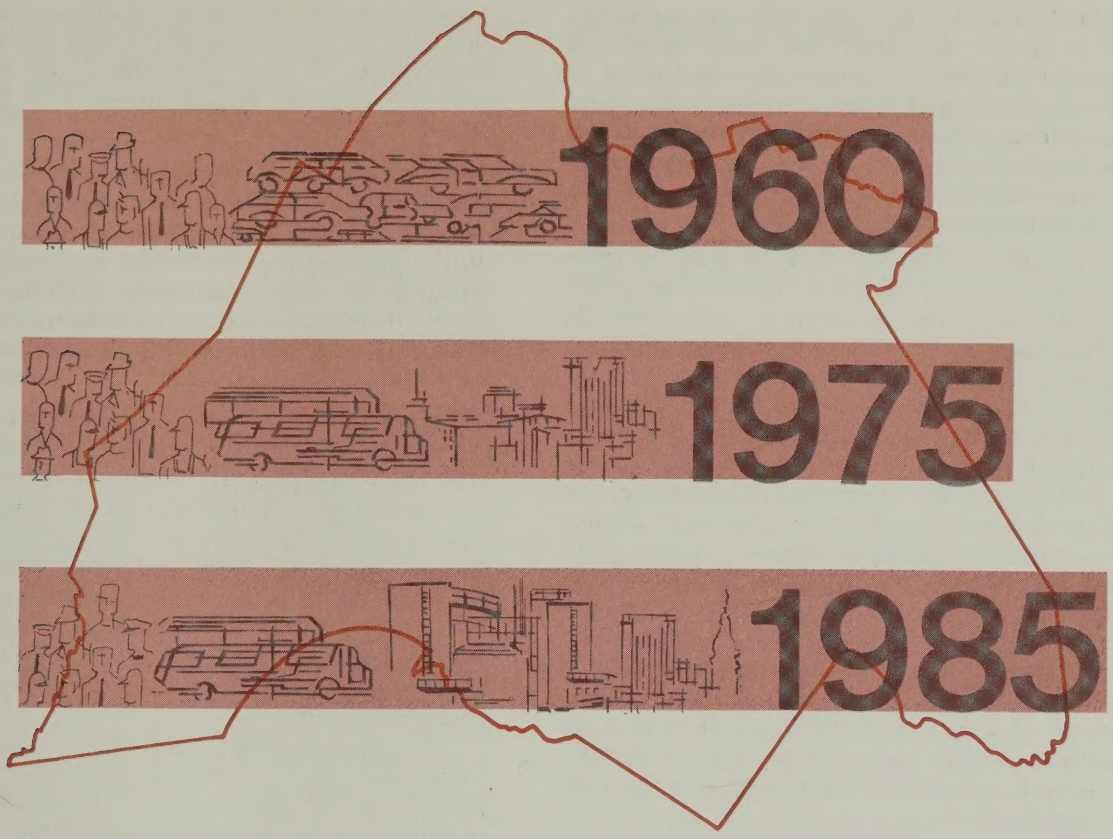
1969

CONTENTS

MAPS

CHARTS

TABLES



1 INTRODUCTION

In 1959 it was clear to civic leaders in the Delaware Valley region that an entirely new approach needed to be taken by government in confronting the transportation problems of the Philadelphia-Camden-Trenton urban area, the third largest metropolitan region in the country. For government to cope effectively with the increasingly complex problems besetting urban centers, closer coordination and more effective communication were needed among all of its levels–federal, state, county and municipal. More specifically, for government to come to grips with the choking traffic problems of both city and suburb, for it to develop an integrated transportation system that would promote rather than compromise the quality of growth and development throughout the region, closer intergovernmental collaboration would have to be achieved.

And more than mere cooperation would be necessary to make this new alliance truly effective: governments would also need to take advantage of the new technologies and innovations in planning that had recently evolved. More scientific approaches to planning for transportation systems at the regional scale were rapidly being developed and the region needed to apply them. Its decision to do so came with the establishment of the Penn Jersey Transportation Study, an interstate compact agency. The governing body of this new agency included representatives from fourteen separate governments in the Delaware Valley area, and gave it a distinctly intergovernmental character. To bring to it the required technical competence, the board employed a staff that included engineers, city and regional planners, mathematicians, data analysts, cartogra-

phers and computer programmers. Penn Jersey also acquired modern, high-speed electronic computers, and it quickly developed new mathematical and statistical planning techniques that enabled it to apply the full rigor of "systems analysis"—a space-age approach to problem solving—to the task it faced: planning for an optimum transportation system for the estimated six and a half million people who would be living in the region by 1985.

The men who guided the Penn Jersey program were informed administrators representing several levels of governments, including the Commonwealth of Pennsylvania, the State of New Jersey, the U. S. Bureau of Public Roads, the City of Philadelphia, the Pennsylvania counties of Bucks, Chester, Delaware and Montgomery, and the New Jersey counties of Camden, Burlington, Gloucester and Mercer.

In the early days of its operations PJ defined five major work program objectives. During its six-year life it succeeded in accomplishing four of those goals. First, it carried out the most extensive regional data collection operation that had ever been undertaken in the Delaware Valley. Massive amounts of information were gathered concerning existing transportation facilities, travel patterns and behavior, use and development of land, the economy of the region, its population, and its government facilities and services. This information provided the data base for the entire PJ planning effort.

Second, from this data PJ drew an up-to-date portrait of the Delaware Valley and published it as PJ Report Volume 1, *The State of the Region.*

Third, using the data it collected and information available for earlier years, PJ made 1975 and 1985 population and employment projections for small areas comprising the region. In order to do this, it developed an advanced mathematical "regional growth model." Called the Activities Allocation Model, it simulated in high-speed computers the regional development process that occurs in the actual world over a 25-year period.

The 1975 regional projections were published in PJ Report Volume 2, *1975 Regional Projections.* The 1985 forecasts were published as DVRPC Plan Report 1, *1985 Projections for the Delaware Valley*.

Finally, PJ developed and tested for performance characteristics a series of alternative regional transportation plans for 1975. These were described, along with the results of the tests, in PJ Report Volume 3, *1975 Transportation Plans*.

In July, 1965 the Penn Jersey Transportation Study was succeeded by a new metropolitan agency, the Delaware Valley Regional Planning Commission. With the establishment of DVRPC, the scope of regional planning in the Delaware Valley was greatly expanded. In addition to highway and public transportation planning, it soon included planning for land use, open space and recreation, water supply, sewage disposal, housing, solid waste, utilities and airports. Moreover, the cities of Chester, Camden and Trenton, which under PJ had been represented by their respective counties, became members of the new agency.

DVRPC inherited PJ's original charge—to develop a regional transportation plan for 1985. It also inherited PJ's staff and facilities, its huge data bank and its planning experience. Yet regional transportation planning is different under DVRPC. It is no longer a temporary thing, as it was thought of under PJ. Rather, planning is now on-going and continuous for the year 1985 and beyond.

The year 1985 was a generation away from 1959, the year PJ was founded. Now 1985 is scarcely 15 years hence, and planners' thoughts have turned to a more distant horizon: the 21st Century. Nevertheless, 1985 was PJ's final target year, the year to which it directed all of its energy and effort. This report completes the PJ effort; it is the accomplishment of PJ's last and most important objective—the development, testing and evaluation of a regional transportation plan designed to meet the needs of the region's population in 1985.

The plan presented here, then, represents the culmination of ten years of continuous regional planning activity and attests to the success of the experiment in intergovernmental cooperation begun with the Penn Jersey Study.

FRAMEWORK OF THE PLAN

At this point it should be stated what the regional transportation plan is and is not. In the first place, the plan amounts only to advice—formulated with extraordinary care, deliberation and expense to be sure, but advice just the same. As Penn Jersey did before, DVRPC serves the region only in an advisory capacity. The state legislation which created DVRPC gave it no powers to implement its plans. The law specifically states that such powers remain with state and local governments and with other agencies in the region.

Second, the 1985 transportation plan covers all modes of urban ground travel—highway, rapid transit, commuter rail and surface transit (bus and trolley). Recommendations regarding new facilities, however, affect only limited-access highways, rapid transit and commuter railroads. The existing turnpikes, the arterial and local street systems, and the local surface transit operations are not enlarged upon in the 1985 plan, although they were included in and tested as part of the proposed 1985 systems. (Proposed extensions of these facilities can, however, be evaluated as a part of DVRPC's continuing planning process.)

Third, the transportation facilities proposed in

the plan are located only within general corridors and *not* as specific alignments. For the purposes of systems analysis the placement and testing of routes along general travel corridors is sufficient to meet regional planning needs. The specific alignment of a facility is determined by federal, state and local transportation officials after the community agrees to its need and after exhaustive engineering and feasibility studies have been conducted.

Fourth, the geographic extent of the 1985 transportation plan is limited to the central, heavily urbanized portion of the nine-county region containing about one third of the land area but nearly 90 percent of the region's population. From the outset, the Penn Jersey Study limited its concern to the 1150 square mile area described as the "cordon area" because the cordon defined the practical limits of urban development in 1960. In addition, the high cost and difficulties involved in data collection and systems testing beyond the cordon area made them prohibitive.

Fifth, the 1985 transportation plan is based on a single land use pattern projected to 1985 and depicted in DVRPC's *1985 Regional Land Use Plan.*

Sixth, there is nothing fixed or static about the 1985 transportation plan. It is, and it is meant to be, a flexible plan subject to change and alteration as deemed appropriate by the DVRPC Board. DVRPC is publishing this report for the purpose of presenting the plan's proposals to the region's governmental units, its civic groups and its private citizens. Suggestions for changes in the plan resulting from public review of it will be studied by the DVRPC Board, and those changes which the Board decides should be tested will be evaluated in light of the effect they would have on the operation of the total regional system.

Seventh, the DVRPC Board has not yet formally adopted the plan proposed here; in keeping with its by-laws, the Commission will adopt a plan only after a public hearing has been held on it.

Finally, the 1985 transportation plan will not provide the region with a panacea for all of its transportation ills. No plan could. There will still be some peak-hour traffic congestion, delays, accidents, stop lights and signs and other kinds of driving nuisances in 1985, even if this plan is put into full effect. This is inevitable, given human behavior, increases in population (of both people and the cars they drive), limited funds, and the restrictions imposed by the urban development patterns and travel habits that have emerged over the region's 250-year history. Nonetheless, travel conditions will be far, far worse than at present if most of the facilities and improvements recommended in this plan are not built by 1985.

IMPORTANCE OF THE PLAN

The prime importance of the 1985 transportation plan lies in its function as a blueprint for public investments. Its basic use, therefore, is as a guide to federal, state and local governments as they invest in transportation improvements for the region. And, the plan offers considerable assurance that the fiscal and land resources committed to improving the region's transportation system will have a maximum payoff.

While the plan provides a carefully reasoned framework for state and local transportation planning and programming, it can also serve as a guide in regional review of state and local transportation improvement projects for which applications for federal assistance have been or will be made. In most metropolitan areas in this country, federal law requires regional review to determine the extent to which a proposed construction project conforms to the area-wide development objectives of its region. For the nine-county Delaware Valley area, DVRPC has been designated the official regional review agency. While the findings of its review are not binding on the federal government, they are carefully considered before decisions are made regarding the funding of new facilities. DVRPC has thus far reviewed local transportation projects whose aggregate cost amounts to well over $800 million.

The 1985 transportation plan also has an immediate, practical benefit to the region. It insures that, in accordance with federal law, the region will continue to be eligible to receive federal highway aid as provided under the Federal Highway Act of 1962. Section 105 of the Act states that metropolitan regions with populations of more than 50,000 must have regional highway planning in order to be eligible for these funds.

The plan has a final importance as a major element in DVRPC's comprehensive regional development planning program. The strong influence transportation has on the region's economy, on the vitality of its central business districts and on its new residential, commercial and industrial growth makes transportation facilities critically important to the region's overall development. It is important, therefore, that planning for highways and public transportation be given high priority. But DVRPC has also completed regional plans for land use, open space, water supply and water pollution control facilities, and is beginning to address other regional needs such as airports. All of these plans contribute to the single, comprehensive plan for the orderly growth and development of the region which is the goal of DVRPC's work program.

2 EXISTING TRANSPORTATION FACILITIES

This chapter examines the existing transportation facilities in the Delaware Valley. The next chapter analyzes the travel demand, or the amount of traffic projected to occur daily in the cordon area in 1985. A realistic attempt at rectifying the obvious disparity between the two—existing supply of facilities and future travel demand—is presented in Chapter 4 as the proposed 1985 regional transportation plan. The final chapter evaluates the plan's ability to accommodate the 1985 travel, and concludes with some general remarks about the prospects for transportation facilities development in the Delaware Valley.

It can generally be said that an imbalance currently exists between high-speed highway and mass transit facilities in the Delaware Valley. In comparison to practically all other urban areas in the United States, the Philadelphia metropolitan area is blessed with an extensive network of rail facilities both within the limits of its principal city and radiating from it into all the neighboring Pennsylvania suburban counties. In contrast, when it is compared to other major urban areas in the country this same region greatly lacks adequate high-speed, limited-access highway capacity.

This is not to suggest that the region does not have deficiencies in public transportation facilities and service. To the contrary, extensive improvements need to be made in its transit as well as in its highway facilities. The extent of this need will be revealed in this report, beginning with the existing highway

A high-type arterial highway—N. J. 38 in Cherry Hill: a four-lane divided highway with free access.

A low-type arterial—Aramingo Avenue in Northeast Philadelphia: a four-lane, undivided city street serving industrial traffic.

Local streets in Levittown, Pennsylvania. In the 25-year period between 1960 and 1985, 16,000 acres of land will be consumed in the nine-county Delaware Valley region to provide local streets in newly developed areas.

system.

EXISTING HIGHWAYS

By far the bulk of the region's existing highway system is made up of high- and low-type arterial highways and streets. These include roads which do not have limited access (limited entry and exit), but which do carry relatively high traffic volumes on two to four-lane roadways, some of which are divided by a median strip or barrier. Excluding expressways, nearly 1600 miles of existing arterial highways and streets were tested as part of the proposed 1985 highway system. They account for over 75 percent of the proposed 1985 highway network.

In addition to these facilities, there are literally thousands of miles of local streets which function as capillaries to the arterial and freeway network. More and more such streets will come into existence as urban expansion continues to spread outward from the core areas. DVRPC projections indicate that 16,000 acres of land which were undeveloped in 1960 will have been paved by 1985 to provide local street capacity for entirely new residential and commercial developments.

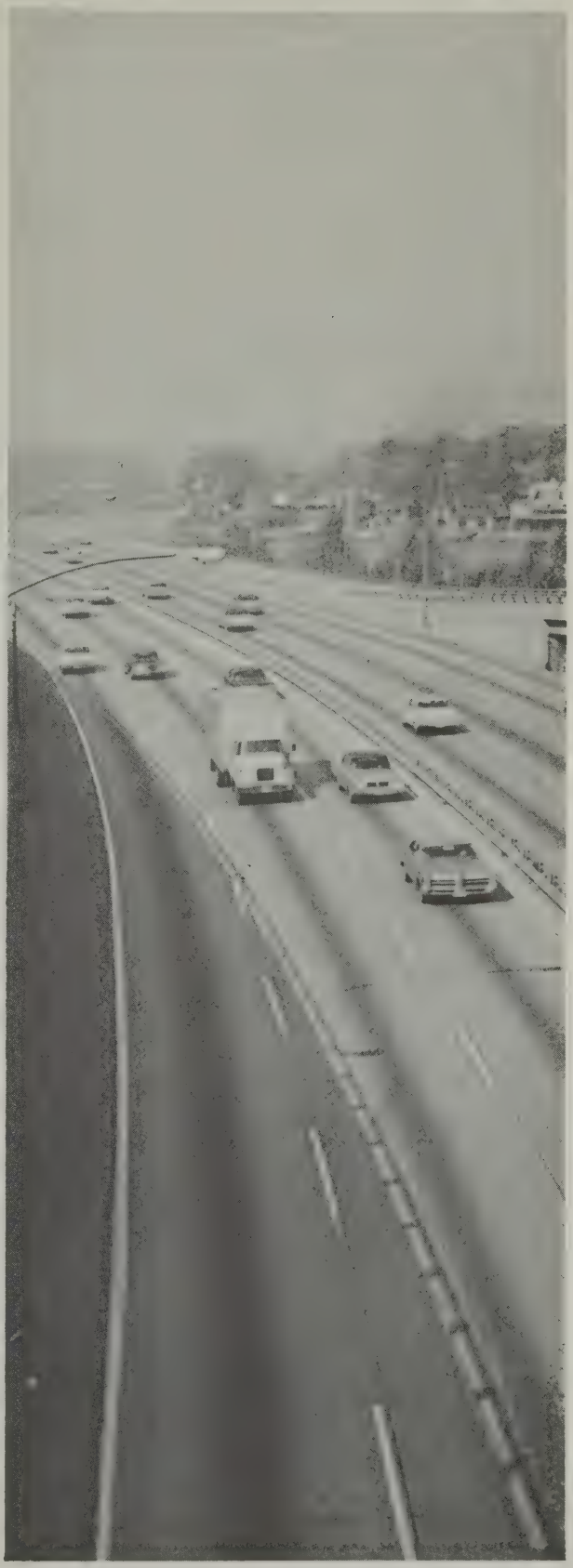
The new highway facilities shown on the 1985 regional transportation plan include expressway (freeway) facilities; all of them have limited access and divided medians. While arterial streets and highways were included in the network which was tested, and will be subjected to further testing as plans are refined and implemented, they are not shown on the 1985 plan. Rather, they supplement the expressway system shown on the plan. So it is the existing supply of expressway which is examined in full below.

The existing network of limited access highways within the DVRPC cordon area totals 213 miles—105 miles in Pennsylvania, 103 miles in New Jersey, and five miles on five bridges spanning the Delaware River.

There are three limited access corridors in the present system. Together they form an A-shaped configuration, with Philadelphia in the center. They include the New Jersey Turnpike to the east and south; the Pennsylvania Turnpike to the west and north; and the combined facilities of the Schuylkill Expressway in Montgomery and Philadelphia Counties, the North-South Freeway in Camden County, and the Atlantic City Expressway, which together form the "cross-bar" corridor of the A-configuration. This latter corridor includes the only major radial routes connecting Philadelphia and Camden City suburbs with Southern New Jersey shore points.

The Turnpikes

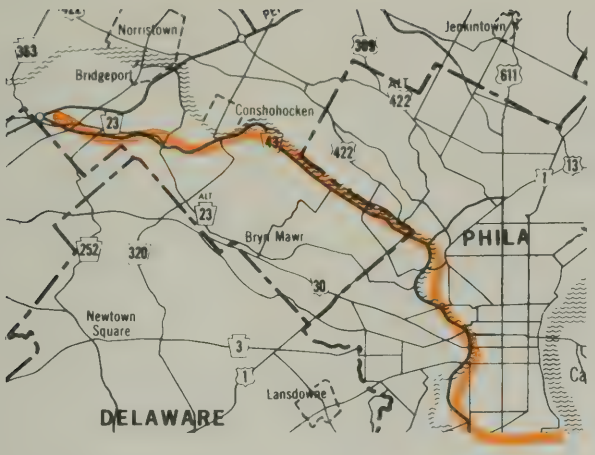
Prior to 1952 the only limited-access facilities in the region were the Pennsylvania Turnpike (which was opened from the west to Carlisle in 1940 and extended to King of Prussia in 1950) and the New Jersey Turnpike (running between New York and Wilmington). These turnpikes serve two broad corri-



dors of traffic which have existed since colonial days: the east-west corridor and the southwest-northeast corridor of the Atlantic seaboard. During the period 1954-1956 these two facilities were connected by the Pennsylvania Turnpike extension to US 13 near Bristol, the New Jersey Turnpike spur to the Delaware River north of Burlington, and the Delaware River Bridge between the two turnpikes.

During this same period, the Northeast Extension of the Pennsylvania Turnpike was opened to provide access to the Pocono Mountain resorts and to Scranton and Wilkes-Barre. The east-west portion of the Pennsylvania Turnpike has since been incorporated into the Interstate System. It is now designated Interstate 76 west of its King of Prussia intersection with the Schuylkill Expressway, and Interstate 276 from there to its connection with Interstate 95 at the Delaware River.

The Schuylkill Expressway, a six-lane, divided, limited-access highway; at present it is Philadelphia's only limited-access radial.



The Schuylkill Expressway

The Schuylkill Expressway connects the western suburbs and the Pennsylvania Turnpike at King of Prussia with the Philadelphia central business district. It was fully opened to traffic in 1958. At the same time the Vine Street Expressway was completed to 16th Street. This link distributes Schuylkill Expressway traffic bound for Center City Philadelphia, and also leads to the Benjamin Franklin Bridge. This section of the Schuylkill Expressway, the Vine Street Expressway, the approaches to the Benjamin Franklin Bridge, and the Bridge itself have been designated Interstate 76. Present proposals include the extension of the Vine Street Expressway from 16th Street to the Bridge as a limited-access facility with interchange to and from Interstate 95.

The New Jersey approach to the Benjamin Franklin Bridge is being extended to the south to intersect the approach to the Walt Whitman Bridge and is designated Interstate 76.

The Walt Whitman Bridge

The Walt Whitman Bridge, which connects the southern part of Philadelphia with Camden and Gloucester counties, was opened in 1957, and the Schuylkill Expressway was extended south and east from Vine Street to connect with the Bridge. This section of the Schuylkill Expressway, the Walt Whitman Bridge, and the bridge approaches on both sides of the Delaware River have been designated Interstate 676.

The North-South Freeway and the Atlantic City Expressway

To serve the travel demands of the expanding South Jersey communities, the North-South Freeway was constructed from the New Jersey approach to the Walt Whitman Bridge south to the vicinity of Turnersville. There a connection has been provided to the Atlantic City Expressway, a toll facility which provides direct access to the major shore resort of Atlantic City and connects with other seashore resorts via the Garden State Parkway.

Other Existing Routes

Portions of Interstate 95 and Interstate 295 have been built and are open to traffic in the cordon area.

Interstate 95 is the major east coast highway of the country's Interstate System. Eventually it will be a limited-access route from Florida to Maine, providing service to Washington, Baltimore, Wilmington, Philadelphia-Camden, Trenton and New York City. In the Delaware Valley (where it is known also as the Delaware Expressway) this route is located in Pennsylvania and passes through the City of Chester and along the south and east edges of Philadelphia. In the vicinity of Bristol it swings northward and then eastward, connects with the Scudder Falls Bridge across the Delaware River north of Yardley, and continues on to the New York City area.

The major completed portion of I-95 is to the northeast, from Rogers Road (Pa. 413) in Bucks County to Bridge Street in northeast Philadelphia. Several other short sections have also been completed, including the Scudder Falls Bridge north of Yardley.

The 1956 Federal Highway Act contained provisions permitting supplementary circumferential Interstate routes in or around urban areas. Interstate 295 provides this type of bypass around the three core areas in the region. It leaves I-95 south of

TABLE 2.1

LIMITED ACCESS HIGHWAYS AND MILEAGE WITHIN CORDON AREA OPEN TO TRAFFIC BY 1967

Map Reference Number	Route Number	Description	Open to Traffic	Total Miles To Date
Interstate—Pennsylvania				
1	I- 76	Pennsylvania Turnpike—W. Cordon to King of Prussia	1950	3.5
1	I-276	Pennsylvania Turnpike—King of Prussia to U.S. 13	1954	32.1
2	I- 76	Schuylkill Expressway—King of Prussia to Vine St.	1959	17.7
2	I-676	Schuylkill Expressway—Vine St. to Walt Whitman Bridge	1960	5.3
3	I- 76	Vine St. Expressway—Schuylkill Expressway to 16th St.	1959	1.0
6	I- 95	Delaware Expressway—U.S. 322 to Flower St.	1959	0.7
6	I- 95	Delaware Expressway—Flower St. to Ridley Creek	1965	2.6
6	I- 95	Delaware Expressway—Bridge St. to Academy Rd.	1967	5.0
6	I- 95	Delaware Expressway—Academy Rd. to S. of Pa. 413	1965	7.6
6	I- 95	Delaware Expressway—at Scudders Falls Bridge	1967	0.5
		Sub-Total, Interstate—Pennsylvania		76.0
Interstate—New Jersey				
2	I-676	Walt Whitman Bridge Connection to I-76	1957	0.4
6	I- 95	Scudders Falls Bridge to Scotch Road	1961	2.7
7	I-295	U.S. 130 (Bridgeport) to Westville (U.S. 130)	1954	7.8
7	I-295	Westville to North-South Freeway	1962	4.4
7	I-295	North-South Freeway to N. J. 73	1963	9.7
7	I-295	N. J. 73 to N. J. 38	1967	4.1
8	I- 76	North-South Freeway to Morgan Boulevard	1957	2.9
		Sub-Total, Interstate—New Jersey		32.0
Interstate—Bridges				
2	I-676	Walt Whitman Bridge	1957	1.0
3	I- 76	Benjamin Franklin Bridge	1926	1.4
6	I- 95	Scudders Falls Bridge	1961	0.8
		Sub-Total, Interstate—Bridges		3.1
Other—Pennsylvania				
9		Pa. Turnpike Northeast Extension—I-276 to N. Cordon	1955	3.5
10	U.S. 309	North Cordon to Ogontz Avenue	1958	7.4
11	U.S. 1	Boulevard Extension—I-76 to 9th Street	1960	3.0
12	U.S. 1	Media Bypass—U.S. 352 to Pa. 320	1959	4.3
13	U.S. 1	U.S. 13 to Trenton Freeway Bridge	1955	1.6
14	U.S. 13	Levittown to U.S. 1	1956	3.9
14	U.S. 13	I-95 to Pa. 413	1965	0.5
15		Woodhaven Rd.—I-95 to U.S. 1	1965	3.6
16	U.S. 322	I-95 to Pa. 452	1959	1.2
		Sub-Total, Other—Pennsylvania		29.0
Other—New Jersey				
31		N.J. Turnpike—N. Cordon to S. Cordon	1951	41.5
31		N.J. Tpk. Connector to Delaware River and I-276	1956	5.5
32	N.J. 42	North-South Freeway—I-295 to Turnerville	1957	8.1
33		Atlantic City Expressway—N.J. 42 to SE Cordon	1964	3.4
34	U.S. 1	Trenton Freeway—N.J. 29 to Whitehead Rd.	1955	3.6
35	N.J. 31	Trenton Freeway to U.S. 1	1955	0.4
36	N.J. 29	John Fitch Way—U.S. 1 to N.J. 579	1955	2.8
36	N.J. 29	John Fitch Way—U.S. 579 to Scudders Falls	1965	3.1
37	U.S. 130	I-295 to U.S. 322	1954	1.7
40		Walt Whitman Approach—I-76 to N.J. 168	1957	.09
		Sub-Total, Other—New Jersey		71.0
Other—Bridges				
1	U.S. 1	Trenton Freeway Bridge	1952	0.5
13		Delaware River Bridge—Pa. Tpk. to N.J. Tpk.	1956	1.4
		Sub-Total, Other—Bridges		1.9

Mileage Summary To Date

	Interstate	Other	Total
Pennsylvania	76.0	29.0	105.0
New Jersey	32.0	71.0	103.0
Bridges	3.1	1.9	5.0
Total	111.1	101.9	213.0

MAP 2.1

EXISTING LIMITED-ACCESS HIGHWAY SYSTEM

Wilmington and crosses the Delaware Memorial Bridge into New Jersey. Then it parallels the New Jersey Turnpike to the vicinity of Bordentown, where it swings to the north and rejoins I-95 north of Trenton. The southern portion of I-295 is completed from US 130 at Bridgeport to N. J. 38 near Moorestown.

The remaining facilities of the existing expressway system consist of scattered segments of planned freeways which are important parts of the 1985 Plan.

The existing limited-access highways and scattered segments are identified in Table 1 and are illustrated on Map 1.

The Market–Frankford Subway–Elevated Line at the Bridge Street terminal in Northeast Philadelphia, showing bus and trackless trolley feeder facilities.

EXISTING MASS TRANSIT FACILITIES

The region's subway-elevated facilities all give direct service to Philadelphia center city, and total approximately 26 miles. They include the Market-Frankford Subway-Elevated, extending five miles to the west and seven miles to the northeast from city center; the Broad-Ridge Subway, extending six miles to the north and two miles to the south; and the Camden Line into center city Camden, approximately two and a half miles. Only minor portions of this network have been added within the last 30 years.

In 1960 there were 31 miles of fast suburban rail facilities feeding into the subway-elevated lines west of Philadelphia's city limits. Mostly on private right-of-way, these facilities terminate at the 69th Street Terminal of the Market-Frankford Line. They serve the suburban territory to Norristown and to Media, respectively 15 and 12 miles from center city Philadelphia, with shorter branches to Sharon Hill and Ardmore. This supplementary rail network has not been expanded within the past 50 years. In fact, in the 1950's a spur of the Norristown Division to Strafford was discontinued, and a division to West Chester was converted to bus in connection with the widening of West Chester Pike. In 1966 buses replaced street cars on the Ardmore Division. Today there are approximately 25 miles of these lines remaining.

Supplementing these 54 one-way miles of rapid transit facilities, there are more than 1,500 one-way miles of other transit routes in the region. They are composed of streetcar, trackless trolley, local and express bus lines.

In 1960 the region's commuter railroad coverage in Pennsylvania consisted of six divisions of the Pennsylvania Railroad and a like number of the Reading Company. Eight of these twelve divisions

Red Arrow's trolley and bus terminal in Upper Darby.

Reading Company's Fox Chase station in Philadelphia. The photo shows its park-and ride lot and the type of commuter rail car now being replaced by modern Silverliners.

New commuter railroad car and parking facilities at Holmesburg Junction on the Penn Central.

provided commuter service beyond the cordon area, and six of them also furnished through service to distant points. Each company maintains its own Philadelphia center city terminal from which its lines radiate. Within the cordon there are 251 one-way miles of commuter route on 203 miles of right-of-way. They effectively blanket the region in Pennsylvania, save for one sector to the west centered on West Chester Pike.

The average length of the effective commuter segments of these lines, which in a few cases extend beyond the cordon line, is 24 miles. The longest (to Doylestown and Trenton) is under 35 miles. About 75 percent of the railroad commuters ride within 15 miles of center city Philadelphia.

Except for a few minor abandonments, there have been no significant changes in commuter railroad coverage in the Pennsylvania sector since the turn of the century.

New Jersey railroad usage (and service) has decreased almost to the vanishing point since the opening of the Benjamin Franklin Bridge in 1926 and the extension at that time of bus service from New Jersey communities into center city Philadelphia. This downward trend was further influenced by the opening of the Walt Whitman Bridge in 1957 and the subsequent construction of connecting freeways on both sides of the Delaware River. Reductions have continued even to the present time, with the abandonment in 1961 of the Camden-Trenton Division

TABLE 2.2

EXISITING RAPID TRANSIT AND RAILROAD MILEAGES WITHIN DVRPC CORDON AREA

Map Reference Number	Facility Description	Route Mileage	Facility* Mileage
	Subway-Elevated		
1	Market—Frankford Sub-El	12.8	12.8
2	Broad Street Subway	8.6	8.6
3	Ridge Spur	1.6	1.2
4	Camden Line	3.7	3.7
		26.7	26.3
	Surface Car Subway		
5	Lancaster-Subway	1.8	1.8
5	Woodland-Subway	2.5	0.7
5	Chester Avenue-Subway	2.5	—
5	Baltimore-Subway	2.5	—
5	Eastwick-Subway	2.5	—
		11.8	2.5
	Suburban Car Routes on Private Right of Way		
6	69th Street-Norristown	13.5	13.5
7	69th Street-Ardmore	—	—
8	69th Street-Media	8.6	8.6
9	69th Street-Sharon Hill	5.3	3.3
		27.4	25.4
	Total Rapid Transit	65.9	54.2
	Railroad Lines from Philadelphia		
10	PRR Wilmington	18.5	18.5
11	PRR Media-West Chester	20.3	19.4
12	PRR Paoli	20.0	19.1
13	PRR Manayunk-Norristown	8.0	3.9
14	PRR Chestnut Hill	12.0	11.1
15	PRR Trenton	33.3	27.8
16	R. Co. Phoenixville	21.5	21.5
17	R. Co. Chestnut Hill	10.8	7.9
18	R. Co. Lansdale-Doylestown	18.8	13.7
19	R. Co. Hatboro	18.6	6.7
20	R. Co. Newtown	26.3	21.2
21	R. Co. West Trenton	32.5	21.7
		240.6	192.5
	Railroad Lines into Southern N.J.		
22	**PRSL Philadelphia-Seashore	25.7	17.0
23	PRSL Camden-Millville	21.9	21.9
24	PRSL Camden-Clementon	—	—
25	**PRSL Camden-Seashore	—	—
26	PRR Camden-Pemberton	24.7	24.7
27	PRR Camden-Trenton	—	—
		72.3	63.6
	Total Railroad	312.9	256.1
	Rapid Transit plus Railroad	378.8	310.3

* Facility Mileage = One-Way Mileage less duplications.

** Only the mileage to the Cordon Line east of Berlin is included.

and in 1966 of the Camden-Haddonfield-Seashore and the Clementon Divisions.[1] The latter two will be replaced in part by the Lindenwold Rapid Transit Line now under construction by the Delaware River Port Authority.

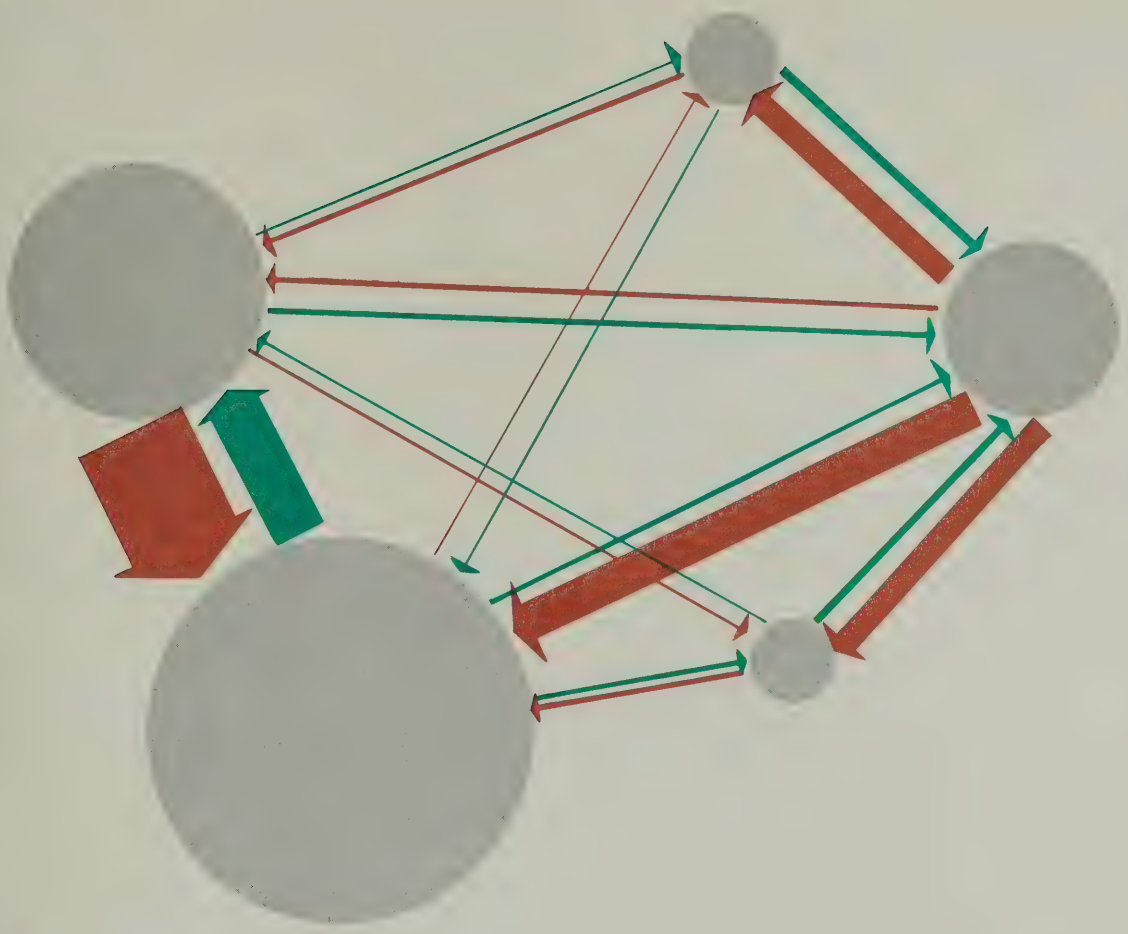
Formerly southern New Jersey was served by a network of railroad lines of two companies radiating out of two terminals in Camden, plus Philadelphia-Seashore service. There now remain only two divisions which give token service from Camden into suburban New Jersey—these by a combination of bus and train—and a third line between 30th Street in Philadelphia and the seashore resorts.

The 1960 and the existing railroad and rapid transit networks are illustrated on Map 2.2 and are tabulated in detail in Table 2.2.

[1] Camden-Haddonfield-Seashore "service" is available by bus from Camden to Haddonfield, and transfer to train at that point.

MAP 2.2

EXISTING RAPID TRANSIT AND COMMUTER RAILROAD ROUTES



3

AN ANALYSIS OF FUTURE NEEDS

The horizon year of the regional transportation plan is 1985. According to projections made by DVRPC the population of the nine-county region will have increased to 6.4 million by then, or 1.8 million more than in 1960, the base year of the DVRPC forecasts. Most of this increase is likely to occur in the newly developing suburban areas which ring the region's principal cities and older suburbs.

Real income throughout the region is also expected to increase markedly by 1985. This fact is nowhere better illustrated than in the rapid growth in the number of privately owned automobiles. There will be approximately 2,020,000 privately owned cars in the region by then, up from 1,139,000 in 1960 for a 77 percent jump in twenty-five years. (This compares with the population increase of 32 percent for the same period.) The average will be 1.20 cars per household, compared to 0.88 in 1960.

The figure 1.20 is the regional average rate of automobiles owned per household. Actual rates vary considerably, of course, from area to area within the region. For instance, although Philadelphia will have many more automobiles than any other county in the region,[1] it is likely to have the lowest auto ownership rate. This is so because of its large population, its greater proportion of lower-income families, and the greater accessibility of public transportation. Not surprisingly, the highest car ownership rates8 are anticipated in the suburban Pennsylvania counties of Chester, Bucks and Montgomery, followed by Gloucester and Burlington Counties in New Jersey.

[1]See Appendix Tables 1 and 2.

DVRPC estimates that 20 percent of the region's households will not own automobiles in 1985. Almost half will be one-car households, and 31 percent, or 522,000, will have two or more cars.[2]

With this marked increase in auto ownership, what will the region's travel needs be fifteen years from now? To answer this question, let us take an average work day in 1985 and consider the number of trips of all kinds we can expect in a 24-hour period then. A trip is defined as travel from a point of origin to a point of destination. Return travel counts as a separate trip. For purposes of this illustration let us distinguish between three kinds of trips: person trips, truck trips and taxi trips. Only the first needs to be explained here. A person trip can be defined as travel made by an individual, regardless of the purpose of the trip or the mode or means of travel used (except truck and taxi trips). For example, a carload of five people going from home to the movies is counted as five person trips, and as five more on returning home from the movies.

DVRPC estimates that over 14,000,000 person trips will be made within the cordon area on that average day in 1985. This is a 78 percent increase over 1960 trips.[3] Thus, in terms of relative growth, total person trips are expected to increase more than twice as fast as total population.

Philadelphia will likely still produce the greatest number of person trips in the cordon area—more than 39 percent of the total. (In 1960, however, it produced 41 percent.) Only in Philadelphia will the growth rate of person trips likely be greater than that of cars owned, revealing a growing dependence on public transportation in the city.

Taxi trips are expected to increase even faster than person trips.[4] DVRPC estimates that approximately 234,000 such trips will be made in the cordon area in 1985, up from 100,000 in 1960. Taxi trips will probably increase at a much faster rate in areas outside the Philadelphia central business district than within it, but of course the absolute number of taxi trips in these areas is much smaller than the number in center city.

The overall growth of truck trips during the period 1960–1985 is expected to be 73 percent, yielding a total of 1,767,000 daily truck trips by 1985. Of all the major areas in the region, the Philadelphia central business district is expected to experience the greatest increase in the number of truck trips, followed by Camden and Gloucester Counties in New Jersey.[5]

Breaking down total person trips according to mode of travel, DVRPC estimates that there will be 1,800,000 trips via public transportation in 1985, or 13 percent of all person trips in the cordon area.[6] Compared to 1960, over one half-million more person trips will be made daily by transit in 1985. Yet, in this 25-year period the proportion of transit trips to total person trips will decline by three percent (down from 16 to 13 percent). Increased highway trips will of course account for this difference.

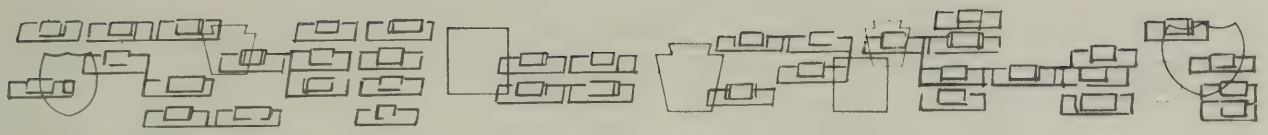
The important thing to note from these figures is not the percentage decline of transit trips to total person trips, but the 40 percent increase in transit trips. This is the first time in the last thirty years that a possible upturn in transit usage can be predicted. The increased transit trips reflect in part the effects of improvements and extensions planned for the rapid transit and railroad systems, and in part the large increase in trip-making in general.

The growth of transit trips will of course vary from one part of the region to another. For instance, north central Philadelphia is expected to have a low growth rate, only eight percent, whereas parts of Bucks County will experience a 300 percent increase, the largest in the region. The highest growth rates for transit ridership are found in those suburban areas where new transit service is to be provided. Thus transit ridership will probably double in the New Jersey counties while increasing only 30 percent in the Pennsylvania counties.

Areas of traditionally high population concentrations will likely have the lowest growth rates in transit ridership. Nevertheless, they will still account for the largest share of transit trips. For instance, 71 percent of all transit trips will occur within Philadelphia.

[2] See Appendix Map 1.
[3] See Appendix Tables 3 and 4.
[4] See Appendix Table 5.
[5] See Appendix Tables 6 and 7.
[6] See Appendix Tables 8 and 9.

Waiting for the 8:26



Broken down according to sub-mode, transit trips in 1985 will be as follows.[7]

SUB-MODE	Daily Number	Percent of Total Transit Trips	Percent Increase Over 1960 Level
Commuter railroad	142,200	8.0	66
Subway-elevated	637,200	35.4	63
Surface transit	1,023,300	56.6	27
Total transit*	1,802,700	100	40

* Includes local and express bus, trolley and suburban car, subway-surface and trackless trolley.

If we subtract transit trips from total 1985 person trips, the residual will be 12,550,000 auto trips, or 87 percent of all person trips. This figure represents the number of trips made by automobile, not the number of automobiles used to make trips. In other words, the figure accounts for the number of passengers, not the number of vehicles expected to be using the roads on a typical weekday in 1985.

Obviously, transportation planners need to know how many vehicle trips are made, since it is the vehicles which the highway system must accommodate. To determine the number of vehicle trips, total person trips made by automobile are divided by a "car occupancy" factor. DVRPC planners have projected a 1985 occupancy factor lower than the one found in surveys made in 1960. Less car sharing is expected in 1985 because real income is projected to increase markedly, more cars are expected to be owned per household, and residences will be more widely dispersed than in 1960.

Planners estimate that there will be 8,362,000 daily vehicle trips in the cordon area in 1985—an increase of 3,853,000 (85 percent) over the 1960 number.[8] This increase is somewhat greater than the increase projected for total person trips (78 percent) and is approximately twice as great as the projected percentage increase in transit trips.

In terms of trip production by geographic areas, 1985 vehicle trip generation is expected to be similar to that of 1960: the largest numbers of auto trips will be produced in the suburban areas. This is especially true of parts of Delaware, Chester, Camden and Burlington Counties.

The vehicle trips described up to this point include those having both their origins and destinations within the cordon area (internal-internal trips) and those with origins within the cordon area and destinations beyond it (internal-external trips). To obtain the full universe of auto driver trips, it is necessary to add those trips with origins beyond the cordon area and destinations within it (external-internal) and those trips passing through the cordon area with both origins and destinations beyond the cordon (external-external or "through" trips). Approximately 537,000 auto driver or vehicle trips are expected to enter the cordon area each day seeking destinations within it. In addition there will be 81,000 similar truck trips. Through trips, including both auto and truck trips, are expected to more than double their 1960 total of 46,000 to reach 112,000 trips by 1985.[9]

Thus in 1985 highway facilities will be needed for a total universe of vehicle trips exceeding 11.1 million on an average weekday.[10]

As is presently the case, most of the through trips will flow along two major traffic corridors in 1985. One is in an east-west direction, roughly in the alignment of the Schuylkill Expressway and US 30. The other is in a north-south direction generally paralleling the Delaware River. A large proportion of internal trips will also be made along these two corridors.

Another important finding is that in 1985 trips will tend to be longer than they were in 1960. Total highway trips are forecast to increase about 81 percent over 1960 levels, while short trips[11] are expected to increase only 62 percent. Similar results are predicted for public transportation. Total transit trips are expected to increase 40 percent by 1985, compared to only 15 percent for short transit trips.

Delaware River crossings by highway in 1985 are projected to be approximately 150 percent greater than 1960 levels.[12] Transit crossings are expected to be over 200 percent greater than in 1960.[13] These

[7] See Appendix Table 10.

[8] See Appendix Table 11.

[9] See Appendix Table 12.

[10] This figure includes all auto, truck and taxi trips, but excludes bus trips.

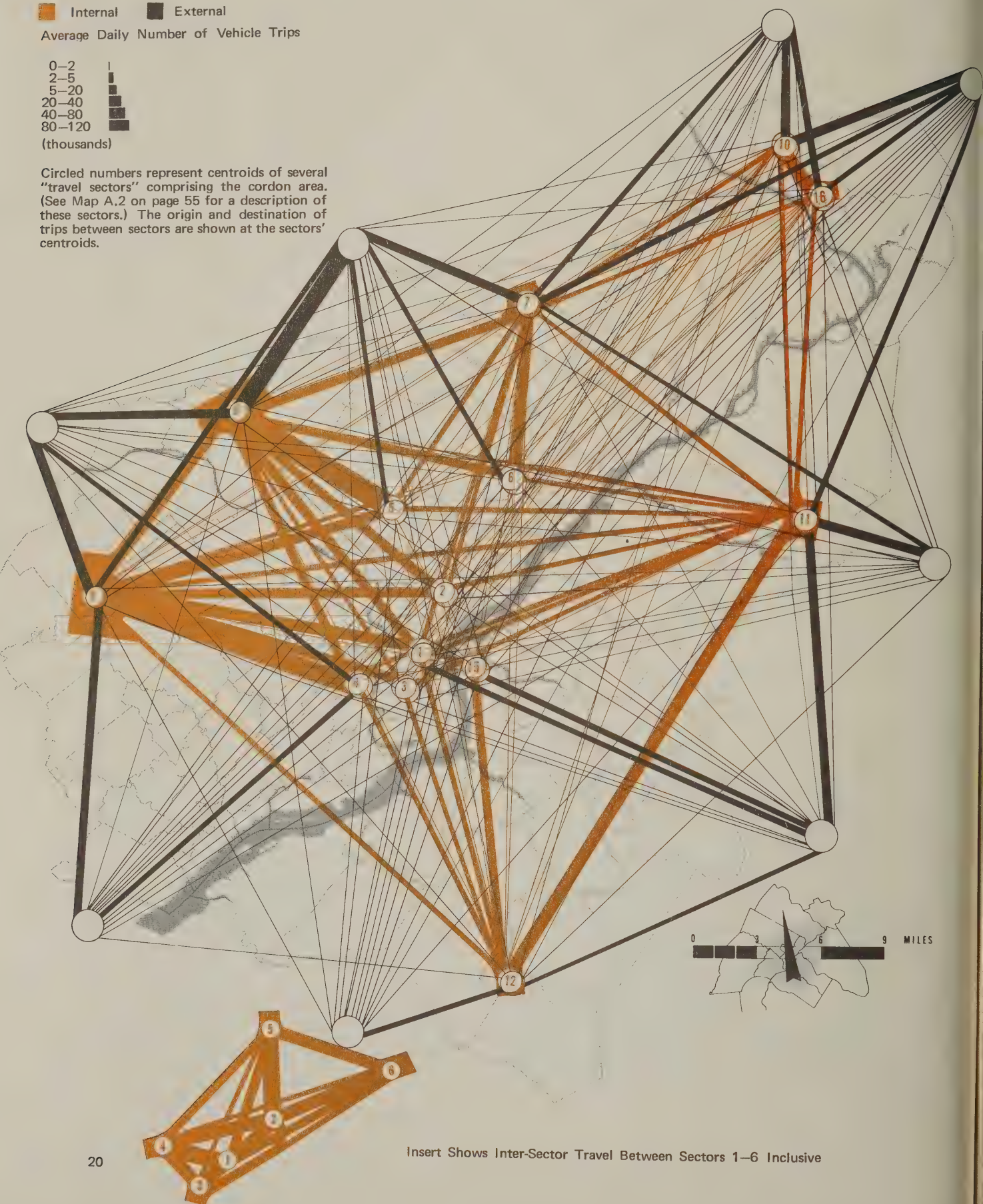
[11] A short trip is defined as an intra-district trip. There are 162 data collection districts in the cordon area.

[12] See Appendix Table 13.

[13] See Appendix Table 14.

MAP 3.1

1985 TRAVEL PATTERNS OF TOTAL VEHICLE TRIPS



large increases are projected because new highway and transit facilities are proposed in New Jersey to feed into the Benjamin Franklin Bridge and because of transit's continuing importance in serving home-to-work and work-to-home trips. Home-to-work and work-to-home trips will constitute 57 percent of the total 1985 river crossings. The large number of home-to-work trips from New Jersey to Pennsylvania emphasizes the continuing importance of the Philadelphia central business district as an employment center.

Travel to and from the Philadelphia central business district is projected to increase about three times over the 1960 level for auto trips and 50 percent for transit trips. Trips made to offices and service centers will account for most of the increase. This finding underscores the need for a greatly improved transportation network which can more adequately serve the Philadelphia central business district.

With reference to the city as a whole, about 2.5 million vehicle trips per day are projected to originate in Philadelphia in 1985, 17 percent more than there were in 1960. This indicates the need for a much improved highway network within the city itself.

Within the City of Camden, 1985 travel is projected to comprise 15 percent of the total number of trips made in the county, while travel within Trenton will comprise 30 percent of Mercer County vehicular trips, indicating Camden's closer ties to Philadelphia. More transit trips than highway trips are projected from Camden to Philadelphia in 1985, showing the need for improvements to transit facilities which link these two centers.

Trenton's 1985 travel patterns show a significant number of trips to Bucks and Mercer Counties. Trenton does not have as transit-oriented a pattern of travel as Camden, indicating a primary need there for an improved highway system.

An analysis of the DVRPC projections of 1985 travel patterns leads us to several important conclusions. They are:

1. Travel patterns and land uses or activities have reciprocal effects. More careful planning of land uses will be a precondition to development of an efficient and economical transportation system to serve this region.

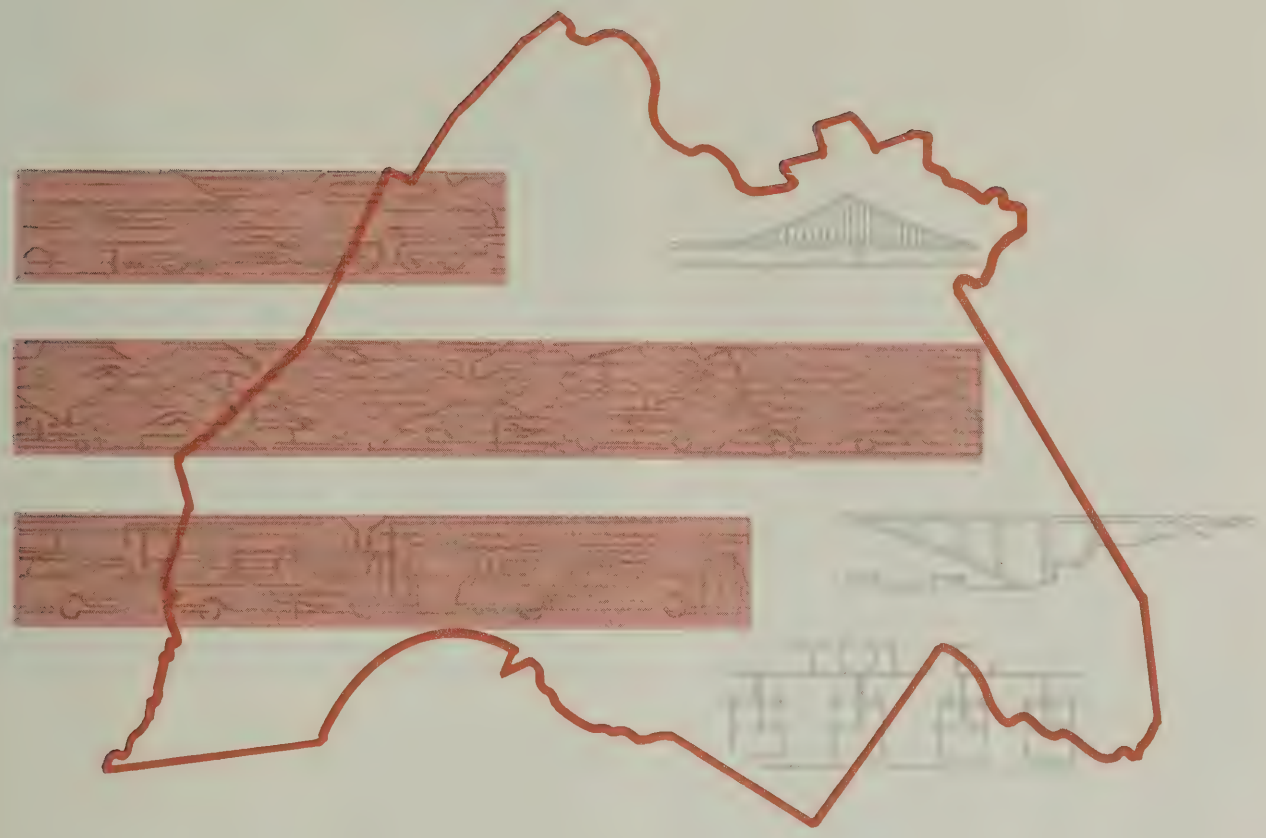
2. This region needs an expanded and much improved transportation system. Whether measured in terms of number of trips, in number of vehicle miles, or in traffic volumes, the magnitude of 1985 travel makes it abundantly clear that a much enlarged and improved transportation system is required to serve the region's needs.

3. The two major corridors of travel within the region, especially, must be served with much better facilities than they have today. These are the north-south and east-west corridors.

4. It is particularly important that new investments be made in high-grade facilities for both auto and transit travel. A greater proportion of automobile trips need to be by way of faster and safer highways, and fast and frequent transit service is needed to supplement the highway system.

5. The central part of the region needs vastly improved facilities. Projections indicate that on an overall basis transit trips will increase up to 40 percent over the 1960 levels, but the *proportion* of transit trips to total person trips to or from the Philadelphia CBD will likely decline by 1985. This will be due to the greater total volume of travel and the disproportionate increase expected in auto trips. But the expected increases in both transit and auto trips are substantial, and they clearly indicate the special need for major new highway and transit facilities to serve the core areas of the region.

The Benjamin Franklin Bridge, with its eight lanes for vehicular traffic and its two rapid transit tracks, was opened to traffic in 1926.



4 THE 1985 REGIONAL TRANSPORTATION PLAN

By 1985 we can expect practically twice as many highway trips as were made in 1960 on an average weekday in the Delaware Valley (85 percent more). We can also expect nearly one and one-half times as many transit trips (40 percent more). Yet DVRPC tests confirm what most residents of the Delaware Valley have no doubt suspected from personal experience—existing transportation facilities cannot accommodate much more traffic without causing expensive and indeed dangerous disruptions to the movement of people and goods throughout the metropolitan area.

The proposals presented in this chapter represent the thinking of DVRPC's constituent governments as to what can and must be done to prepare the Delaware Valley for the vast increase in travel expected in the not-so-distant future. If they accomplish nothing else, but avert the disabling effects of congestion mentioned above when they are put into effect, then these proposals will have done much to assure the future well-being of the region.

Proposals concerning the highway and transit systems are described in separate statements.

1985 FREEWAY PLAN

The starting point in developing an improved freeway system is the existing system. As Chapter 2 has indicated, the region now has only a few limited-access roads, and DVRPC's analysis of their ability to satisfy current and projected travel demand reveals serious deficiencies in the present system. Deficiencies are equally apparent in the other types of

highways in the region, particularly in high-type arterials.

Although it does not include proposals for new arterial highways, the 1985 plan nonetheless could do much in improving their performance. A major benefit of the proposed new freeways is the appreciable relief they can afford to heavily-travelled arterial highways. By attracting longer trips, especially through trips, they can relieve arterial highways of much of this sort of traffic, allowing them to handle the shorter trips and distribute local traffic more efficiently.

The importance of the freeway and its ability to attract through traffic are amply demonstrated by the following facts. In 1960, limited-access roads accounted for only eight percent of the total miles of arterials within the region's cordon area, but they accommodated about 19 percent of all travel. In Philadelphia only three percent of all arterials, in miles, was limited access, but served about 10 percent of all vehicle-miles of travel in the city.

The role of the freeway will be even more significant to 1985 travel, which, as indicated in Chapter 3, will be characterized by many more trips and by longer trips—the sort of traffic for which freeways are most suited.

DVRPC projections of 1985 trip origins and destinations, coupled with its forecasts of the dispersion of residential growth and employment, plus what is already known of past land development and travel patterns in the region, make it clear that there are major corridors through which heavy volumes of 1985 traffic would tend to flow if the corridors were provided with the necessary capacity.

All of the Interstate highways in the cordon area whose alignments had earlier been decided upon were found to service many of these corridors, and they were included in the 1985 plan. The location of certain other new freeways had also been committed to construction by the two state highway departments by then. They, too, were found to service corridors of heavy travel demand and were included as part of the 1985 regional system. Neither of these coincidences came as a surprise, considering the long history of transportation planning by the states, counties and cities in the region, and the exhaustive research and individual testing that had gone into their planning and development.

Thus, in developing the 1985 plan all Interstate routes and those freeways already committed to construction by the states were added to the existing system. The rest of the freeways proposed in the 1985 plan were developed from careful analysis of the remaining deficient travel corridors. In this analysis various engineering techniques were applied to help determine optimal spacing between freeways.

Construction of the Delaware Expressway (I-95) near Girard Avenue in Philadelphia.

From these analyses a specific configuration of circumferential and radial freeways emerged that is presented below as the 1985 freeway plan. The plan is described according to the three principal features of its overall configuration: circumferential, radial and feeder routes.

Distinctions are readily drawn between circumferential and radial routes. For instance, it is said that the function of a radial route is to move traffic swiftly into and out of the urban core, whereas the purpose of a circumferential is to distribute traffic around the city (when the highway is located within the city), or to enable traffic to by-pass the city (when the circumferential is located outside its limits). No doubt such explanations are over-simplifications of what in fact are complex mixes of many different travel patterns, but they are helpful in describing the principal features of the plan.

Circumferentials

At present there are no circumferential corridors within or without the region's three principal cities, save possibly the Pennsylvania Turnpike. In contrast, the 1985 freeway plan provides each of these urban centers with expressway loops.

Inner-City Loops

In the 1985 plan Philadelphia is largely enclosed

by a limited-access loop that is made up of the following facilities:

1. *The Delaware Expressway* (I-95), extending along the Delaware River to the south and east sides of the city.

2. *The Cobbs Creek Expressway* (I-695), extending from I-95 in the vicinity of Philadelphia International Airport northward along Cobbs Creek to the vicinity of Baltimore Avenue, where it swings east to intersect the Schuylkill Expressway on the fringe of center city Philadelphia.

3. *The West Philadelphia Expressway*, extending from the Cobbs Creek Expressway northward to connect with the Roosevelt Boulevard extension of the Schuylkill Expressway.

4. *The Roosevelt Boulevard Extension* continues the existing limited-access route 3.6 miles further north to the Tacony Freeway.

5. *The Tacony Freeway* extends eastward from the Roosevelt Boulevard to intersect with the Delaware Expressway and connect with the proposed *Delair Bridge*, which will span the Delaware.

Two short east-west corridors, the *Vine Street Expressway* and the *Crosstown Expressway*, connect the Schuylkill and Delaware Expressways, making a short loop around Philadelphia's central business district. Because they also intersect with the city's larger peripheral loop, these east-west corridors complete two other circumferentials—one around North Philadelphia and one around South Philadelphia.

The 1985 Plan also provides the city of Camden with an inner-city loop. It is formed by:

1. *Interstate 76*, a link running along the west side of town to connect the Walt Whitman and Ben Franklin Bridges. This link extends the North-South Freeway corridor north for 3.6 miles.

2. *The Camden-Burlington Expressway*, which extends this corridor further north along the river to the eastern approach of the Delair Bridge.

3. *The Camden Inner Loop*, which extends from the Delair Bridge approach around the east side of the city and connects with the Walt Whitman Bridge approach south of town.

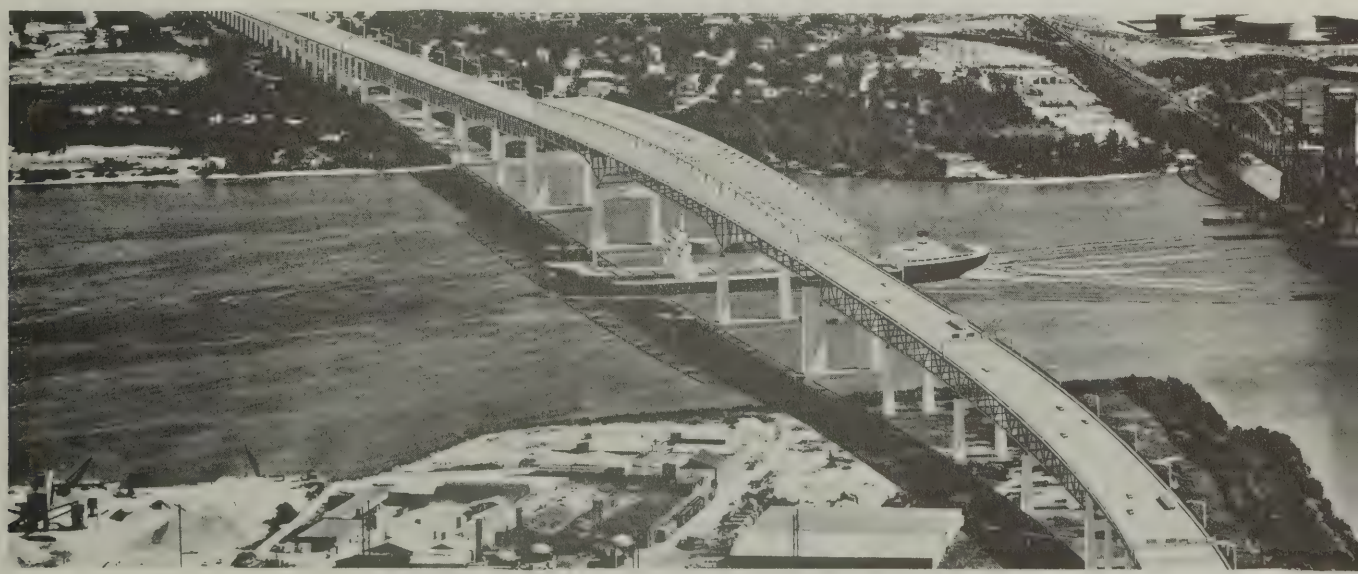
(By linking the corridors of the Camden Inner Loop and the Philadelphia loop, the Walt Whitman and Delair bridges create a circumferential around the centers of both cities.)

Outer Loops

In the 1985 Plan a wider loop around Camden is completed to the east of the city by the connection which the *N. J. 90 Freeway* provides between I-295 to the east and south, and the Burlington-Mount Holly Expressway to the north. (The western portion of this loop is again provided by I-76.) The N. J. 90 Freeway extends east from the Delair Bridge; later it bends north to the vicinity of Moorestown and then east again to intersect I-295.

An outer loop around Philadelphia is also provided in the 1985 plan. It is formed by the Pennsylvania Turnpike to the north, the Delaware Expressway (I-295) to the east and south, and the Mid-County Expressway (I-476), also known as the Blue Route, to

Proposed Philadelphia–Delair Bridge



Proposed Chester-Bridgeport Bridge, scheduled to be open to traffic by 1972,

and the ferry it will replace.

the west. The Mid-County Expressway provides access to the Pennsylvania Turnpike on the north and to I-95 on the south. In addition it is a direct route between the city of Chester and Conshohocken.

The plan also extends this large outer loop into New Jersey to encompass the Camden urban area by a combination of the following facilities:

1. *The Chester-Bridgeport Bridge*, which spans the Delaware between the City of Chester and Bridgeport (replacing the existing Chester Ferry), and connects I-95 with the US 322 Expressway in New Jersey.

2. A short portion of the *US 322 Expressway*, from the bridge to I-295. (The expressway continues east along the south cordon line, past Glassboro in Gloucester County to the east cordon line, distributing and collecting traffic to and from I-295 and the New Jersey Turnpike.)

3. I-295 as far as its intersection with the Burlington-Mount Holly Expressway.

4. *The Burlington-Mount Holly Expressway*, which extends northwestward from I-295 to connect with the proposed Burlington-Bristol Bridge.

5. *The Burlington-Bristol Bridge*, a high-level structure over the Delaware River at Burlington City. It will replace the existing drawbridge between Burlington and Bristol. Its western approach will connect with the Delaware Expressway (I-95) near Bristol in Bucks County. Shortly after, I-95 intersects with the eastern end of the Pennsylvania Turnpike to complete the outer Philadelphia-Camden circumferential.

Segments of I-95 and I-295 combine with the *N. J. 29 Freeway* to form a circumferential around the city of Trenton in the 1985 plan. From I-95 at Scudder Falls Bridge the N. J. 29 Freeway runs along the north bank of the Delaware River to I-295 north of Bordentown. (Its corridor continues east as I-195, passing beyond the east cordon line.) A portion of the N. J. 29 Freeway between I-95 and US 1 is now open to traffic, including a segment of the John Fitch Parkway.

I-295 loops Trenton on its east and north sides to re-connect with I-95 on the city's west side. By linking these two interstate routes south of the city, the Burlington-Mount Holly Expressway and Burlington-Bristol Bridge deepen the circumferential around Trenton. (This connecting corridor also provides a similar link in the Camden-Philadelphia outer circumferential.)

Radials

In the existing freeway system there are only two major limited-access radials serving the Philadelphia-Camden metropolitan area: the Schuylkill Expressway to the west, and the North-South Freeway to the east in Camden County (connecting with the Schuylkill Expressway in Philadelphia via the Walt Whitman Bridge). As mentioned earlier, in the 1985 plan the North-South Freeway corridor is extended north to connect with the eastern approach to the Ben Franklin Bridge and, via the bridge, with the Vine Street Expressway in Philadelphia. (Vine Street is continued as limited access from 16th Street to the bridge.) This entire corridor—the Schuylkill Expressway from the Turnpike, the Vine Street Expressway, and the North-South Freeway from the Ben Franklin Bridge to I-295—is designated as I-76.

Two additional radials from the Camden area are provided in the plan. One, the *US 30 Expressway*, extends from the Ben Franklin Bridge approach southeastward through the city to intersect with I-295 near Haddonfield. The other is the *N. J. 55 Freeway*, which extends from I-295 to the south of Camden near Westville to carry traffic directly to the resort areas of Wildwood and Cape May.

The plan also adds six more radials from Philadelphia. Two of these have already been described, namely the north and south extensions of the Delaware Expressway. The other four radials are all spokes from the Philadelphia inner loop. Accordingly, reference can best be made to them as they appear consecutively and counter-clockwise along the loop, starting with the Northeast Freeway.

1. The *Northeast Freeway* extends from the Tacony Creek Freeway in Northeast Philadelphia, north and generally parallel to the Roosevelt Boulevard, to connect with the US 1 Freeway at the Pennsylvania Turnpike. (The US 1 Freeway continues this corridor northeast, passing through the center of Trenton.) Coupled with Philadelphia's inner loop, the Northeast Freeway permits access from Bucks County not only to central Philadelphia, but also to West Philadelphia and the communities in Delaware and Montgomery Counties to the west and to Trenton to the east.

2. *The Fort Washington Expressway* (US 309) is the next radial along the loop. It begins in the vicinity of Girard Avenue and 5th and 6th Streets, running north by northwest to intersect the Roosevelt Boulevard extension (the inner loop). From there it goes north to Ogontz Avenue to join the existing portion of US 309 Freeway, which continues north through central Montgomery County past Ambler.

3. *The Girard Avenue Expressway*, the next radial along the loop beyond the Schuylkill Expressway, extends due west from the Delaware Expressway to US 1 near Lancaster Pike and City Line Avenue. This short radial has the added function of widening Philadelphia's center city loop to the north.

4. *The Lansdowne Expressway* extends the Crosstown-Cobbs Creek Expressway corridor westward to connect with the Mid-County Expressway below Newtown Square in Delaware County. This route will provide direct western access to center city Philadelphia, as well as to points north and south via the Mid-County Expressway.

The 1985 plan has five limited-access radials from the City of Trenton. All but one of them have been mentioned earlier. Two were described in the context of the Trenton loop—the N. J. 29 Freeway running west and I-195 continuing the corridor east. The other two are the northern and southern extensions of the US 1 Expressway from the center of Trenton. (To the south, in Bucks County, US 1 connects with Philadelphia's Northeast Expressway radial.) The fifth radial is the *N. J. 31 Freeway* which spurs northwestward from the US 1 Expressway near the center of Trenton to the north cordon line, where I-95 and I-295 intersect.

Feeder and Other Routes

The 1985 plan has several important limited-access roads feeding the Pennsylvania Turnpike and the Schuylkill and Mid-County Expressways in Chester, Delaware and Montgomery Counties.

One of them, the *King of Prussia Spur*, extends northwest from the Mid-County Expressway at Ithan in Delaware County to the King of Prussia area. From there it continues north as the existing *County Line Expressway* to the vicinity of Betzwood, where it crosses the Schuylkill River and continues due west to Pottstown as the proposed *Schuylkill Expressway Extension*.

The Schuylkill Parkway runs perpendicular to this north-south corridor. It follows the south side of the river from Betzwood to the new *Norristown Bridge*, presently under construction.

From its intersection with the Schuylkill Expressway below Bridgeport, the *US 202 Expressway* continues west through Chester County along the alignment of existing US 202 to West Chester, skirting Paoli and Malvern.

The *Woodhaven Expressway* runs parallel to the Philadelphia-Bucks County border, inside the city. A portion is now open to traffic from the Delaware Expressway to the Roosevelt Boulevard. In the 1985 plan this route is extended to the Pennsylvania Turnpike, providing Northeast Philadelphia with direct access from the west as well as from eastern Montgomery County.

One additional facility is provided in the 1985 plan. This is the *N. J. 38 Expressway* in Burlington County, which connects with I-295 east of Moorestown and projects northeast for eight miles to the cordon line near Mount Holly.

SUMMARY OF THE 1985 FREEWAY PLAN

The freeway portion of the 1985 plan adds 300.9 miles of limited-access highways to the existing

TABLE 4.1

1985 FREEWAY PLAN
(Mileage and Cost)

Map Reference Number	Route Number	Description	Miles	Cost (Million 1968 Dollars)
Interstate—Pennsylvania				
2	I-76	Schuylkill Expressway—Widen Various Locations	—	4.7
3	I-76	Vine Street—16th Street to Delaware Expressway	1.4	57.5
4	I-476	Mid-County Expressway—Delaware Exp. to Pa. Tpk.	22.7	115.1
5	I-695	Cobbs Creek Expressway—Delaware Exp. to Schuylkill Exp.	6.9	139.2
6	I-95	Delaware Exp.—South Cordon to Scudders Falls Bridge (including Delair Bridge Interchange)	38.9	377.6
		Sub-Total, Interstate—Pennsylvania	69.9	694.1
Interstate—New Jersey				
6	I-95	Scotch Rd. to North Cordon	1.9	6.0
7	I-295	South Cordon to U.S. 130 (Bridgeport)	3.4	4.3
7	I-295	N.J. 38 to North Cordon	28.4	105.0
8	I-76	Ben Franklin Bridge to Morgan Boulevard	3.6	23.0
36	I-195	I-295 to East Cordon (N.J. Route 37 Freeway)	3.9	7.8
		Sub-Total, Interstate—New Jersey	41.2	146.1
Other—Pennsylvania				
10	U.S. 309	Ogontz Avenue to Roosevelt Boulevard Ext.	4.5	50.4
11	U.S. 1	Roosevelt Boulevard Ext.—9th St. to Tacony Fr.	3.6	11.8
13	U.S. 1	Pennsylvania Turnpike to U.S. 13 Expressway	9.5	23.4
14	U.S. 13	Pa. 413 to Levittown	6.9	12.5
15	—	Woodhaven Road—U.S. 1 to Pennsylvania Turnpike	4.8	19.7
16	U.S. 322	I-95 to Chester Bridge	1.0	9.1
17	—	Lansdowne Exp.—Mid-County Exp. to Cobbs Creek Exp.	5.9	52.2
18	—	Crosstown Expressway—I-95 to I-676	2.8	85.2
19	—	Tacony Freeway—U.S. 1 to I-95	3.5	71.6
20	U.S. 1	Northeast Freeway—Tacony Freeway to Pa. Tpk.	11.3	82.1
21	—	King of Prussia Spur of Mid-County Expressway	6.0	43.7
22	—	W. Phila. Expressway—Cobbs Creek to Schuylkill Exp.	4.8	67.5
23	U.S. 202	West Cordon to Schuylkill Expressway	7.3	9.7
24	U.S. 202	Norristown Bridge—U.S. 202 to U.S. 422	1.7	9.4
25	Pa. 363	County Line Expressway—U.S. 202 to Pa. 363	2.6	5.9
26	—	Pottstown Extension—Pa. 363 to West Cordon	0.7	2.5
27	U.S. 202	Betzwood—New Hope Expressway—Pa. 363 to North Cordon	3.0	10.6
28	—	Burlington—Bristol Bridge Approach to Delaware Exp.	1.8	3.1
29	—	Industrial Expressway—Delaware Exp. to Schuylkill Exp.	3.0	18.0
29	—	26th Street—Industrial to Schuylkill Exp.	1.1	2.9
30	—	Schuylkill Parkway, Norristown Bridge to Pa. 363	4.4	8.1
43	—	Girard Exp.—U.S. 1 to Delaware Exp.	5.6	112.5
44	U.S. 309	Ft. Washington Exp.—Roosevelt Blvd. to Girard Exp.	3.5	43.9
		Sub-Total, Other—Pennsylvania	99.3	755.8
Other—New Jersey				
34	U.S. 1	Trenton Frwy. (N.J. 174)—Whitehead Rd. to Northeast Cordon	1.5	4.5
35	N.J. 31	U.S. 1 to North Cordon	4.0	7.9
36	N.J. 29	Trenton Freeway to I-295	4.4	26.0
38	N.J. 90	Delair Bridge to N.J. 73	6.3	42.0
39	N.J. 55	I-295 to South Cordon	17.5	26.3
41	U.S. 322	Chester Bridge to I-295	0.9	1.4
41	U.S. 322	I-295 to East Cordon	20.0	25.4
42	—	Burlington—Mt. Holly Exp. (I-395)—Bristol Bridge to I-295	3.8	5.3
45	—	Camden Inner Loop—N.J. 168 to N.J. 90 Exp.	8.0	42.9
46	U.S. 30	U.S. 30 Exp.—I-76 to I-295	6.0	40.2
47	—	Camden-Burlington Exp.—I-76 to N.J. 90 Exp.	3.9	19.5
48	N.J. 38	Expressway—I-295 to Cordon Line	8.0	14.4
		Sub-Total, New Jersey	84.3	255.8
Other Bridges				
16	—	Chester-Bridgeport Bridge	3.1	79.1
19	—	Delair Bridge	2.0	69.6
28	—	Burlington-Bristol Bridge	1.1	39.7
		Sub-Total, Other—Bridges	6.2	188.4

Mileage Summary	New Facilities			Total Region		
	Interstate	Other	Total	Interstate	Other	Total
Pennsylvania	69.9	90.2	160.1	145.9	119.2	265.1
New Jersey	41.2	58.4	99.6	73.2	129.4	202.6
Bridges	—	6.2	6.2	3.1	8.1	11.2
Total	111.1	154.8	265.9	222.2	256.7	478.9
Cost Summary (Million Dollars)						
Pennsylvania	694.1	599.4	1,293.5			
New Jersey	146.1	138.8	284.9			
Bridges	—	188.4	188.4			
Total	840.2	926.6	1,766.8			

MAP 4.1

1985 FREEWAY PLAN

system in the cordon area: 169.2 miles in Pennsylvania, 125.5 miles in New Jersey, and 6.2 miles in river crossings. The total of all freeway miles provided under the plan (including existing mileage) is 513.9, of which 274.2 are in Pennsylvania, 228.5 in New Jersey, and 11.2 in bridge crossings. The cost of the plan is estimated at approximately two billion dollars.

The plan provides two Interstate highways running the length of the region on both sides of the Delaware River; freeway loops around Philadelphia, Camden and Trenton; an inner-city loop around the Philadelphia central business district; and broad outer loops around the Philadelphia and Camden metropolitan areas. In addition the plan provides for nine radial corridors into Philadelphia (including two existing ones), three radials into Camden and five into Trenton; three new Delaware River crossings; and feeder corridors to Philadelphia's two western radials.

Map 4.1 shows the individual facilities added by the 1985 freeway plan, and Table 4.1 lists their lengths and costs.

THE PUBLIC TRANSPORTATION PLAN

In planning an integrated system of highway and public transportation facilities to serve this expanding region, it is of primary importance that rapid transit lines be extended beyond their present limited coverage of seven miles or less from center city Philadelphia. Such extensions should be provided particularly to areas which have or will have dense populations and concentrations of employment or service activities, thus making available an alternate means of fast, direct transportation.

The problem in transit differs radically from that in highways. Capacities are far less critical with transit than with highways. A transit facility can accommodate added travel demand either by increasing train length or by improving headways, or both. In contrast, substantial capital costs are involved when added lanes or new highway facilities must be built to accommodate increased travel. Whereas the region has few limited access, high speed, high capacity roadways, its twelve commuter lines radiate from center city Philadelphia to serve all of the counties in the region, and these rail lines are supplemented by a four-pronged subway-elevated system within the city. With this wealth of transit facilities, it would seem to be more important to develop their maximum potential than to construct new lines which could impair the ability of the present systems to continue in operation.

This is not to imply that no new rapid transit facilities are needed. In the New Jersey sector, and to a much lesser degree in Pennsylvania, this need is particularly apparent, but the emphasis on transit should be directed primarily toward (1) improving the performance and the amenities of existing facilities so as to offer an attractive alternative to the automobile, and (2) supplementing these existing facilities with express buses as freeways become available.

The railroad lines as they exist today were built 40 or more years ago under specifications then considered adequate. Some improvements have been made since then, but these lines do not approach modern standards. Many of the railroad cars are of an ancient vintage and their replacement should have first priority. Stations should be improved. Adequate park-and-ride lots are essential, especially at railroad and other rapid transit stations. Long-deferred railroad track maintenance and signal improvements should be undertaken. Convenient local distribution should be available in the form of a bus or other sub-system at both ends of the trip.

The City of Philadelphia and SEPTA have identified the major improvements that are needed in the present public transportation system to raise its level of performance and to enhance its competitive position with the private automobile. These improvements, whose total cost is estimated at $510 million, are shown in detail in Table 4.2.

TABLE 4.2

PLANNED IMPROVEMENTS TO PUBLIC TRANSPORTATION SYSTEM

Description	Cost (Million 1968 Dollars)
Transit Facilities	
Market Subway, Concourse and Stations E. of 15th St.	6.26*
Market Subway, West Plaza 15th St. Improvement	7.95*
69th Street Terminal Reconstruction	5.20
Frankford Elevated, Relocate for I-95	6.65*
Frankford Elevated Structural Repairs	2.72*
Frankford Elevated, Power Facilities	4.18*
Locust-8th Subway, Changes for Lindenwold Line	1.37*
Ridge-8th & Market Station Reconstruction	7.54*
SE Cor. 8th & Market Improvements (Market Station)	.35*
Broad-Ridge-Locust, Concourse and Station Rehabilitation	10.95*
Broad-Ridge-Locust, Replace Miscellaneous Equipment	2.53*
Broad-Ridge-Locust, Maintenance Equipment	1.29*
Broad Subway Power Facilities	1.70*
Broad Subway Car Rehabilitation	.53
Broad Subway, Purchase DRPA Cars	.26*
Broad Subway, Replace Cars	36.00
Subway Systems, Selected Waterproofing	.44*
Subway Communications System	.89*
Subway-Surface Car Modification for MU Control	1.14*
Track Replacements—SEPTA	15.00
Trackless Trolley Route 66 Extension	.32*
SEPTA Route 47 Reconstruction for Vine Street	.29*
Chestnut St. Mall Vehicles	4.80*
Micro Bus Demonstration Project	1.00
Transit Shelters on Street	2.10
Replace SEPTA Woodland Barn	2.00
Replace SEPTA Germantown and PST Co. Barns	2.80
Additional Track—PST Co.	.50
PST Co. Grade Crossing Elimination	10.00
New PST Co. Cars	5.00
New Buses	59.30
Camden Transportation Terminal	5.00
Trenton Transportation Terminal	1.50
Cheltenham & Ogontz Terminal	.20*
Subtotal Transit	207.76
Railroad Facilities	
Railroad Station Improvements	5.00
RR High Level Stations, Chestnut Hill Division	.96
RR High Level Stations, Other Divisions	15.00
RR Track and Signal Improvements	30.00
RR Grade Crossing Eliminations	70.00
Additional Track North of Wayne Junction	20.00
Connect Reading Co. & Penn Central at N. Phila.	29.30
New RR Commuter Cars	88.20
RR Car Rehabilitation	4.30
Park and Ride Lots	30.40
New MU Repair Shop	3.50
RR on-train Communication System	4.40
Car Washer and Commuter Car Maintenance Equipment	.71*
Princeton Junction Station Improvements	.60
Subtotal Railroad	302.37
Total, All Improvements	510.13

* These items included in Philadelphia's 1968-1973 Capital Program.

Generally, they include such items as new vehicles, track and signal modifications, high-level railroad station platforms, and grade crossing eliminations—all of which will improve the speed of operation. Other improvements include such items as expanded park-and-ride lots, station and concourse improvements, transit terminals and shelters, additional power facilities, carhouse reconstruction, and maintenance items. DVRPC includes all of these improvements as part of its 1985 regional transit facilities plan.

Both the entirely new transit facilities and the extensions or modifications of existing ones included in the 1985 Plan are discussed below according to area: first the New Jersey counties, then the city of Philadelphia, and finally the Pennsylvania suburban counties.

The New Jersey Counties

The New Jersey portion of the region is now without any effective rapid transit service. The only existing rapid transit facility, the Bridge Speed Line, connects only the central business districts of Philadelphia and Camden. Railroad service in South Jersey is limited to the rush hours, and using it requires one change to reach center city Philadelphia and two changes for other Philadelphia destinations.

There are four major corridors of travel from Camden into the New Jersey counties. All are served by highways: Broadway to the south, Black and White Horse Pikes to the southeast, Moorestown-Mount Holly Pike to the east, and US 130 to the north.

The DVRPC 1985 transit facilities plan shows an extension of the existing rapid transit line over the heaviest of these corridors—the one to the southeast —from Broadway Station in Camden to Lindenwold. The Lindenwold Line is now under construction by the Delaware River Port Authority. The existing rapid transit line begins at 16th and Locust Streets in Philadelphia and operates via Locust Street, 8th Street, the Benjamin Franklin Bridge, and 5th Street to Broadway Station, Camden. The new facility is 10.8 miles long and will extend rapid transit service approximately 14 miles from center city Philadelphia southeast into New Jersey. It includes parking lots at terminal and intermediate stations, and transit car storage and inspection facilities at Lindenwold. The project is estimated to cost $88,000,000, including cars. DVRPC's travel projections indicate that the line will carry 70,000 passengers daily.

A recently completed study of the territory to be served by the Lindenwold Line recommends a series of feeder bus routes to serve it, eliminating certain parallel routes and modifying others to function as feeders.

These improvements will offer an integrated solution to Lindenwold corridor transportation needs. There will be effective rapid transit of the most modern type direct to center city Philadelphia, supplemented by coordinated surface transit which will both feed the rapid transit line and serve local travel needs.

Five commuter railroad lines formerly radiated from Broadway Station in Camden. The Trenton Division was abandoned in 1960. The Haddonfield-Seashore Division and the Clementon Division were discontinued in 1966, leaving only the Millville Division and the Pemberton Division in operation. These latter two divisions have 46.6 miles of facility. They no longer operate into Broadway Station, but terminate at 12th and Federal Streets in Camden, with transfers to buses at that point. Only inbound morning rush and outbound afternoon rush service is

Westmont Station on the Delaware River Port Authority's new Lindenwold Rapid Transit Line.

being furnished, with two daily trains each way on each division.

Although these two commuter rail lines remain in New Jersey, they cannot be considered a solution to the New Jersey transportation problem. Quite simply, they do not deliver people to where they want to go. The retention of this service is of questionable value. If it were discontinued, the rail rights-of-way might be used for new rapid transit developments or for exclusive bus-ways.

With the DRPA entering the transportation field when the Lindenwold Line opens, it would seem logical for the Authority to have responsibility for development of all public transportation facilities serving southern New Jersey—bus as well as rail—within the 35-mile limit of its present authorization to operate. Such a step would permit full coordination of all southern New Jersey transit, and through cooperative efforts with SEPTA in Pennsylvania it could offer a comprehensive and coordinated solution to the region's public transportation problems.

The Philadelphia Sector

As already noted, the high-speed transportation lines serving Philadelphia consist of three railroad divisions and a four-pronged subway-elevated system.

The subway-elevated system extends from the city center for two miles to the south, five miles to the west, six miles to the north, and seven miles to the northeast.

The region's commuter railroad lines are designed primarily to serve the suburbs, though two divisions operate entirely within the city. Both railroads have Chestnut Hill divisions serving Germantown, Mt. Airy and Chestnut Hill in the northwest corridor. The Newtown Division of the Reading Company serves primarily Philadelphia, with less than 10 percent of its riders destined to points beyond the city limits. The other lines serve scattered Philadelphia stations as an adjunct to their suburban operations.

The one sector of the city not conveniently served by fast public transportation is the far northeast. The City of Philadelphia submitted a recommendation to the electorate, approved in November 1964, authorizing the construction of a Broad Street Subway Northeast Extension to serve this area. The Extension will begin at the Broad Street Subway at or near Pike Street, extend diagonally under Hunting Park Avenue to Roosevelt Boulevard, and continue under the Boulevard to Adams Avenue, where it will run in the median strip of the proposed Northeast Freeway to Rhawn Street. It will be a 6.2-mile, two-track extension, enlarging the area of rapid transit coverage in the Northeast to about 10 miles from center city. It will be a subway from Broad Street to Adams Avenue, but is generally in open cut north of Adams Avenue. Facilities will be provided at Rhawn Street for public parking and for transit car storage and inspection. The total cost is estimated at $85,300,000, including cars. DVRPC travel projections show that 110,300 trips will be made daily over this extension.

In November, 1964 the electorate also approved a 1.4-mile extension of the South Broad Street Subway from its present terminus at Snyder Avenue to Pattison Avenue. It will provide improved transit to South Philadelphia and the Navy Yard, will serve the proposed Municipal Stadium and Sports Arena directly, and will offer more convenient interchange with the Walt Whitman Bridge for New Jersey motorists and bus lines. A parking lot and limited transit car storage facilities are provided at Pattison Avenue. Including cars, this facility is estimated to cost $24,300,000. Ridership is estimated at approximately 20,000 daily, not making allowance for stadium events.

Both these subway extensions are included in the DVRPC 1985 transit facilities plan. A third major Philadelphia project included in the plan involves a tunnel connection between the commuter lines of the Penn Central and Reading companies. The Penn Central (formerly Pennsylvania Railroad) commuter lines now terminate at a stub terminal under John F. Kennedy Boulevard near 16th Street. The Reading

Port Authority's maintenance shop at Lindenwold

Company commuter lines terminate at an elevated stub terminal north of Market Street between 11th and 12th Streets. The City of Philadelphia proposes to connect the tracks of these two companies by a subway under John F. Kennedy Boulevard, Filbert Street and Darien Street, joining with the existing Reading Company tracks at about 9th and Poplar Streets. A new station between 10th and 12th Streets will replace the Reading Terminal. Existing Reading Company elevated trackage (1.2 miles) south of Poplar Street will be abandoned, including the Spring Garden Street station. The new facility will provide improved distribution of commuters within the city center. It will give Reading Company passengers the benefit of direct delivery to both Penn Center and 30th Street Station, and will give Penn Central passengers delivery east of Broad Street. It will also permit through-routing of service between the two railroads and will provide an important link in the City of Philadelphia's Market Street East development program. This project involves total construction of 1.7 miles at an estimated cost of $60,000,000.

A fourth Philadelphia project included in the 1985 transit facilities plan is the City of Philadelphia's Eastwick redevelopment and airport improvement program. The City proposes to upgrade the portion of Subway-Surface Route 36 south and west of Island Road and Elmwood Avenue. The Eastwick Avenue section of this route is to be relocated to the right-of-way of the Reading Company, which lies between Bartram and Eastwick Avenues, and the line will be extended to Cargo City at Philadelphia International Airport. Only limited stops will be made on the relocated section. This project relocates and extends two miles of route at an estimated cost of $1,300,000.

As new freeways are developed in the area, they may lend themselves to an expansion of the present express bus system and to the possible establishment of occasional turnouts or "way stations" with parking facilities and feeder bus connections to serve express bus lines.

In its Market Street East redevelopment program the City of Philadelphia is considering the possibility of an off-street bus terminal which would connect with the Vine Street Expressway by ramps. Such a facility could serve as a terminus for some of the existing express bus lines, as well as for others which might prove feasible.

The Pennsylvania Counties

The 1985 transportation plan proposes no new subway-elevated lines into the Pennsylvania suburban counties, and includes only two minor commuter railroad improvements. First, extension and electrification of the Reading Company Hatboro Division is proposed from Hatboro to Warminster, approximately two miles, coupled with improvements between Glenside and Warminster. Extensive parking facilities are proposed at the new Warminster terminal. Estimated cost is $1,300,000.

Second, a connection is proposed between the Reading Company's Newtown and West Trenton Divisions at Huntingdon Valley-Beth Ayres, together with electrification between Huntingdon Valley and Newtown. With this connection in place, service would be discontinued for 3.3 miles between Fox Chase and Huntingdon Valley and one lightly used station—Walnut Hill—would be abandoned. This project is estimated to cost $2,500,000.

The need in the Pennsylvania suburban counties is not primarily for additional high-speed lines but rather, as previously stated, for measures which will increase the use of existing lines.

SUMMARY OF THE 1985 TRANSIT PLAN

The total cost of the public transportation portion of the 1985 plan is estimated at $772,800,000, of which $262,700,000 is for 24.1 miles of new rapid transit and railroad facilities and $510,100,000 is for general improvements to existing facilities.

The plan shows the following changes in existing facility mileage:

Subway-elevated mileage is increased 70 percent —from 26.3 miles to 44.7 miles.

Surface car-subway mileage is unchanged at 2.5 miles.

Surface car on private right-of-way mileage is increased 8 percent—from 25.4 to 27.4 miles.

Railroad mileage within the cordon line in Pennsylvania is decreased 0.4 percent from 192.5 miles to 191.7 miles. Reflected in these figures is the abandonment of 3.3 miles of Reading Company service from Fox Chase to Huntingdon Valley, and replacement of 1.2 miles of Reading Company elevated structure by a tunnel south of Poplar Street.

Railroad mileage within the cordon line in New Jersey is decreased 74 percent—from 63.6 miles to 17.0 miles. This reflects the abandonment of all railroad service out of Camden, 60 percent of which has already occurred between 1960 and 1967.

Maps 4.2 and 4.3 show the proposed rapid transit and railroad systems respectively.

Table 4.3 lists the individual facilities, their mileage, and their costs.

MAP 4.2

1985 SUBWAY–ELEVATED AND RAPID TRANSIT PLAN

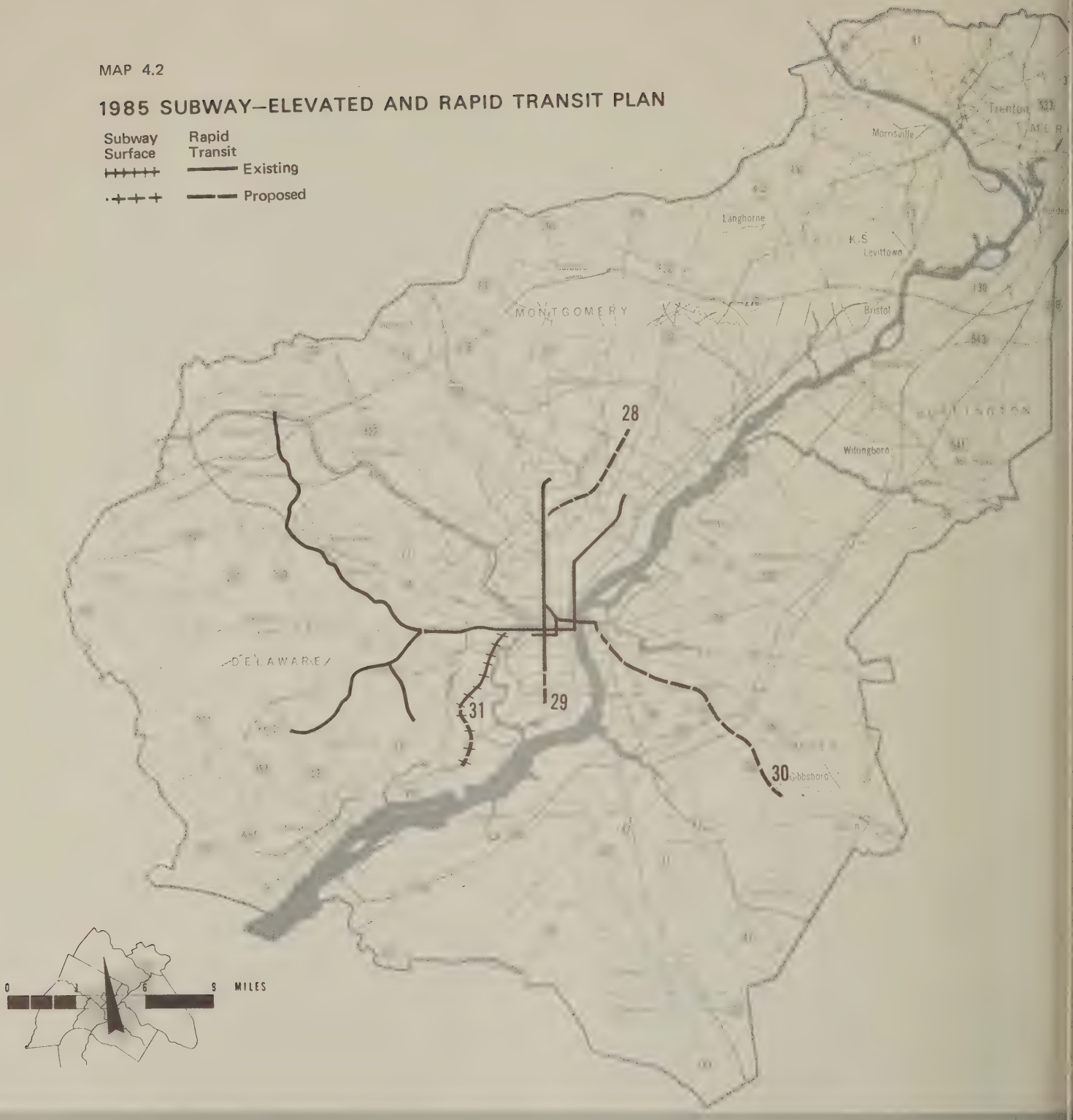


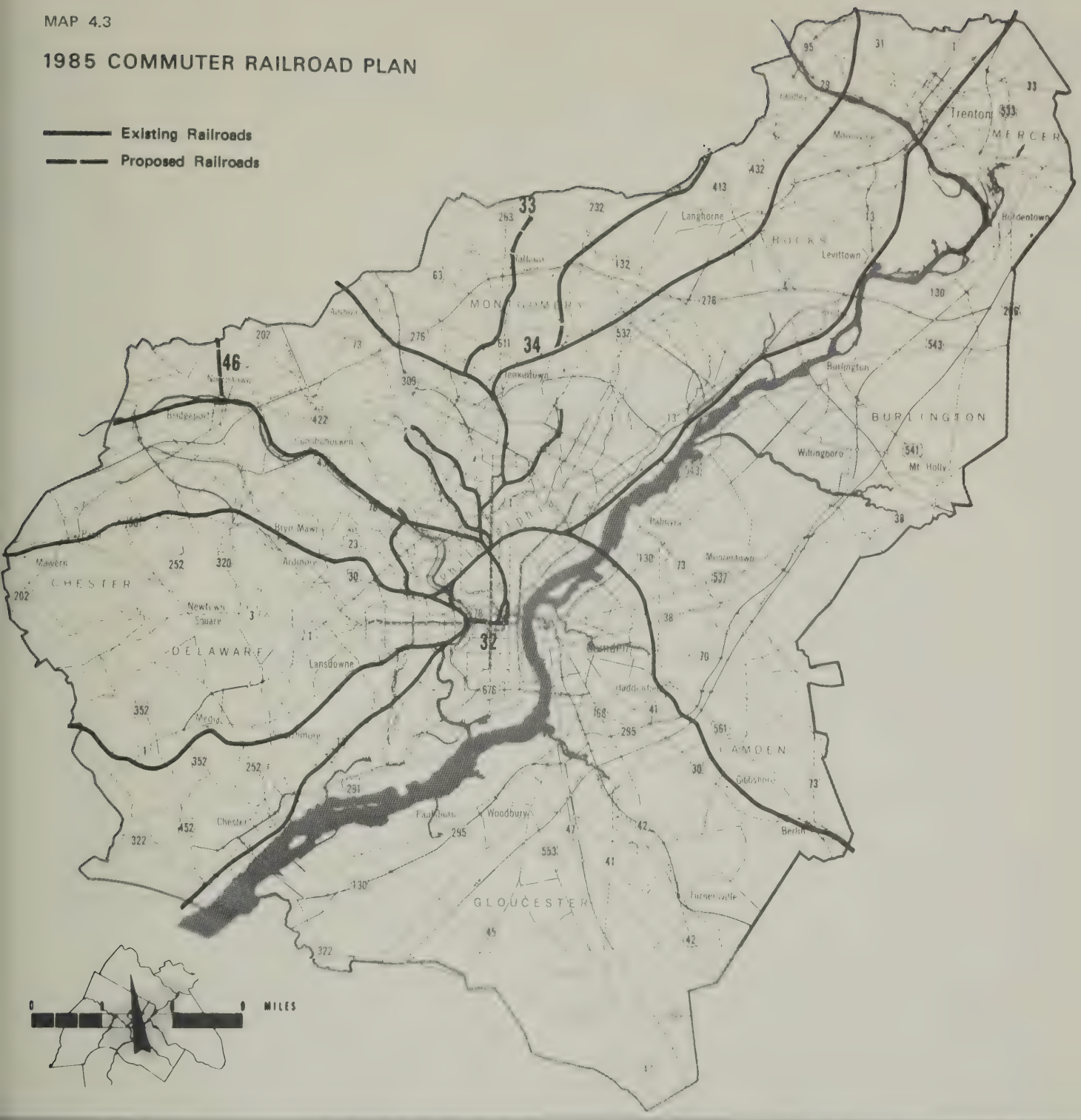
TABLE 4.3

1985 PUBLIC TRANSPORTATION PLAN MILEAGE–COST

Map Reference Number	Description	Facility Miles	Cost (Million 1968 Dollars)
Rapid Transit			
28	Northeast Subway to Rhawn Street	6.2	85.3
29	South Broad Subway to Pattison Avenue	1.4	24.3
30	Lindenwold Line	10.8	88.0
31	Eastwick Subway Surface Route to Airport	2.0	1.3
	Sub-Total, New Facilities	20.4	198.9
	Existing Facilities	54.2	—
	Total Rapid Transit	74.6	198.9
Railroad			
32	Center City Railroad Connection	1.7	60.0
33	Warminster Extension of Hatboro Division	2.0	1.3
34	West Trenton-Newtown Connection	—	2.5

MAP 4.3

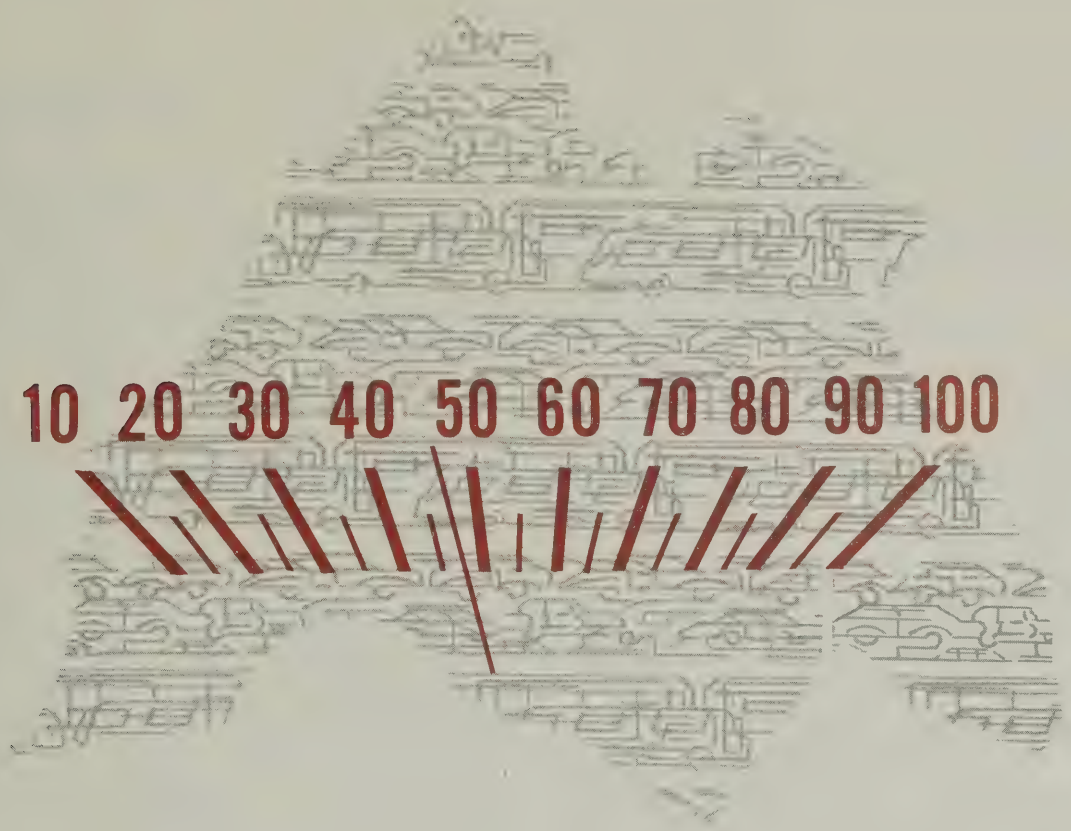
1985 COMMUTER RAILROAD PLAN



	Sub-Total, New Facilities	3.7	63.8
	Facilities Abandoned[1]	51.1	—
	Existing Facilities	256.1	—
	Total Railroad	208.7	63.8
Other Improvements			
	Transit System	—	207.8
	Railroad System	—	302.3
	Sub-Total, Other Improvements	—	510.1
Summary			
	New Facilities	24.1	262.7
	Other Improvements	—	510.1
	Facilities Abandoned[1]	51.1	—
	Existing Facilities	310.3	—
	Total Plan	283.3	772.8

[1] Facilities Abandoned include the following:

Reading Co., Poplar Street to Reading Terminal	1.2 Miles
Reading Co., Fox Chase to Huntingdon Valley	3.3 "
PRSL Camden-Millville Division	21.9 "
P. C. Camden-Pemberton Division	24.7 "
Total	51.1 Miles



5 PERFORMANCE OF THE 1985 PLAN

The 1985 Transportation Plan described in Chapter 4 is only one of an almost unlimited number of such plans that might be devised for the DVRPC region. It was selected from a series of alternative plans and combinations of highway and transit systems on the basis of its probable performance—as determined by tests conducted by DVRPC. These tests were performed with computers and simulation models. The same procedure is being used to test additions and deletions to the plan, providing the evaluations of changes that are needed to continuously refine and update the plan.

This chapter describes the probable performance capabilities and limitations of the highway and transit systems comprising the 1985 Transportation Plan.

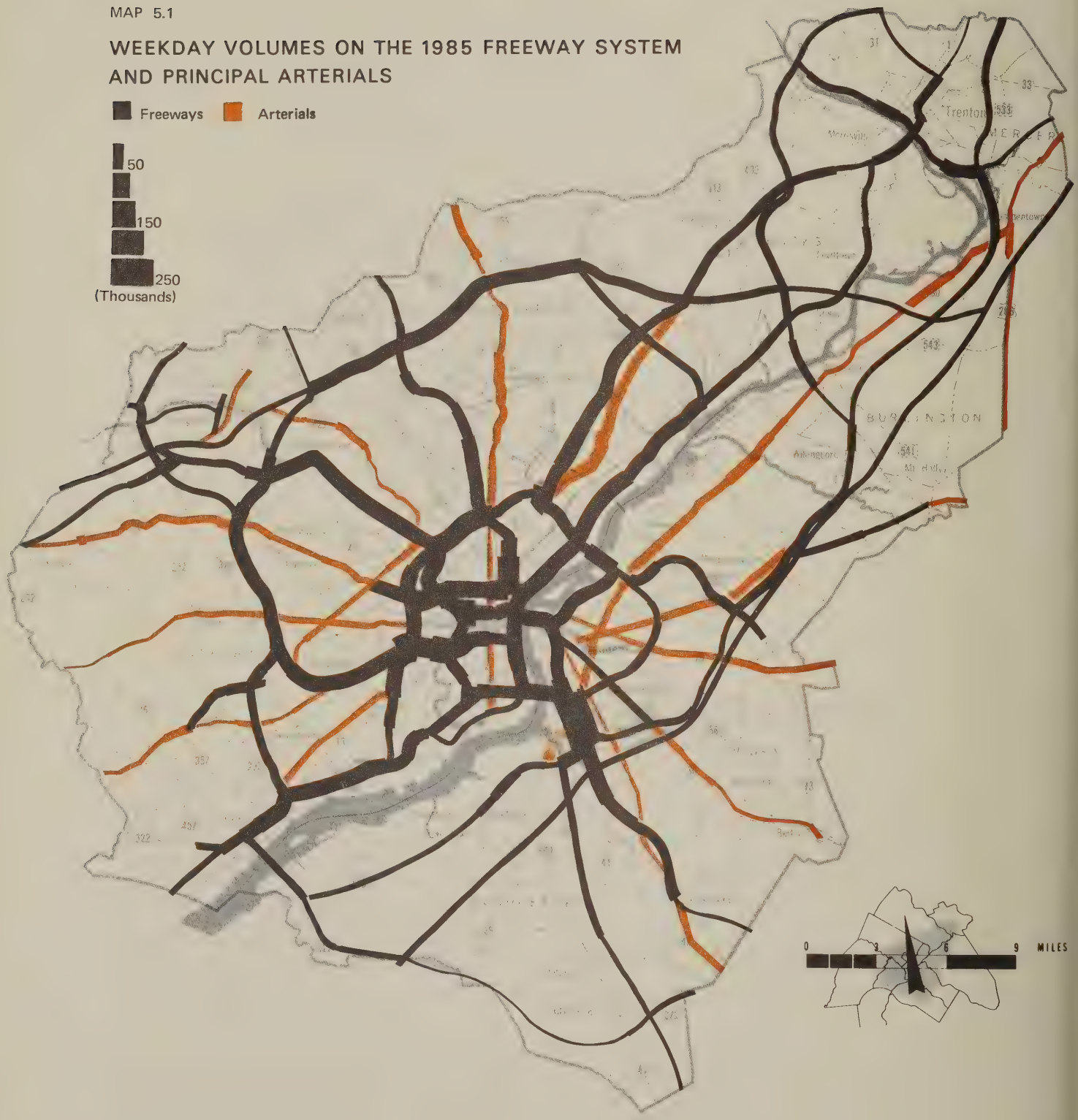
DVRPC uses a transportation planning technique called "traffic assignment." In applying the technique, the DVRPC computer is fed data on the origins and destinations of all trips that have been projected for 1985; then it "assigns" those trips to the most appropriate routes offered on the plan being tested. These are the shortest possible paths between two points or, put in another way, the routes with the least travel cost. The computer is programmed so that when a certain highway becomes overcrowded some of its traffic is automatically shifted to a less congested neighboring facility, provided of course that one can be found. This redistribution of traffic simulates what occurs in the actual world.[1]

The traffic assignment tests conducted on the

[1] It does not occur on transit facilities, however. Unlike highway capacity, commuter rail and subway-elevated transit capacity is flexible and can be increased or decreased to equal travel demand by adjusting the frequency of service or, when feasible, by increasing or decreasing train length.

MAP 5.1

WEEKDAY VOLUMES ON THE 1985 FREEWAY SYSTEM AND PRINCIPAL ARTERIALS



1985 plan have provided information that allows DVRPC to evaluate the plan's performance potential, identifying both its strengths and its deficiencies.

HIGHWAY PERFORMANCE

The simplest way of determining the performance potential of a highway is to measure the amount of traffic congestion expected on it. From the data produced by traffic assignments, DVRPC analysts are able to make these measurements for all highways shown on the 1985 plan.

There are two principal ways of measuring congestion. The first is by comparing traffic volume (the number of cars on the road for any given period of time) to highway capacity (the number of cars the highway is able to handle in the same period of time). The second means of measurement, directly related to the first, is the speed of traffic flow over a highway. The volume of traffic on any section of highway may continue to increase with no reduction in speeds until a point is reached when, with the addition of more traffic, there is a corresponding decrease in speed and delays begin to occur. From there on the speeds decrease as congestion increases.

Before analyzing the performance potential of the plan in terms of these two measurements, it would be appropriate to examine the amounts of traffic the DVRPC computer actually assigned to the proposed 1985 highway system. These are shown on Map 5.1 for the freeway (limited access) and principal arterial systems. The time period for which the volumes shown are measured is a typical week day in 1985.

To make the freeway map more meaningful, compare the volumes it shows against the average daily traffic volume on a portion of the Schuylkill[2] today—namely, 138,000 vehicles; or compare them against the present daily volume on a segment of the North-South Freeway[3] in Camden County—81,000 vehicles. Both volumes are considerably above the present average for the region.

Having estimated traffic volumes on the proposed 1985 highway system, one can turn his attention to the other side of the coin—capacity. Highway capacity is the product of many design factors, not the least of which is the number of traffic lanes provided in the highway. Obviously, highway capacity will increase with an increase in the number of lanes.

Highway engineers generally agree that 1,500 vehicles per hour is the practical capacity of a lane of urban freeway. Thus, knowing the daily traffic volumes projected to pass over each of the freeways and principal arterials in the 1985 plan, one can estimate the number of lanes that will be required for each route to avoid undue congestion in the system. Map 5.2 shows this.

Notice that some existing facilities will not require additional lanes to accommodate 1985 travel demand. Most, however, show the need for considerably more lanes than were proposed initially.

For the purposes of traffic simulation, a specific number of lanes had to be coded into the computer for each highway shown on the 1985 plan so that the computer would know its traffic capacity. Only with such information would the computer be able to simulate the redistribution of traffic among the system's highways whenever and wherever congestion occurred. The number of lanes first judged "appropriate" for each highway had to be determined on the basis of transportation planning experience and on such guidelines as have been established regionally by the Pennsylvania and New Jersey highway planning divisions, as well as upon DVRPC's knowledge of the region and its present traffic patterns.

In Map 5.2, several numbers are shown next to various highways. These indicate the number of lanes coded into the computer and they establish the traffic capacity for those highways. The difference between the number of lanes shown to be required for a highway to fully accommodate 1985 travel demand, and the number it was actually provided in the traffic assignment tests, represents the additional capacity required if the highway is to operate without serious deficiencies.

From the information noted on this map, it seems clear that the number of lanes originally coded and tested for many important limited-access routes was below the number which will probably be needed in 1985.

Yet one must realize that the capacities originally provided and tested by DVRPC were based not only on intuitive judgments of need, but also on assumptions as to the land use, engineering, political and financial constraints that will no doubt operate to frustrate the development of all the lanes that might theoretically be needed on various routes. The land costs alone would be extraordinarily high in urban and suburban areas. Design problems would be greatly magnified, especially with reference to interchanges and relocations of parallel arterials. Furthermore, the additional capacity of such a system would be almost entirely needed to handle rush-hour traffic and for the most part would not be required the rest of the day, thus preventing a maxi-

[2] Between Spring Garden and Vine Streets.

[3] Between Kings Highway and Market Street in Gloucester City.

MAP 5.2

DEFICIENCIES ON SECTIONS OF THE 1985 HIGHWAY SYSTEM

mum return on investment. So it is no simple or inexpensive matter to build urban freeways with more than three or four lanes in each direction.

For the above reasons, it is reasonable to expect that the number of lanes ultimately provided in new freeways will be close to the number originally tested. This being the case, we must expect traffic congestion in 1985. Exactly how much we shall now see.

If all of the new freeways proposed in the 1985 plan are built and include the limited number of lanes coded for them, specific levels of performance can be estimated for each major type of highway. They are discussed in the following paragraphs.

Volume versus Capacity

Congestion, in terms of the volumes and capacities of specific routes, can be examined first. Then it can be measured in terms of its effect on speeds.

From a capital investment point of view the optimal situation occurs when the volume of traffic equals the capacity of the highway on which it flows. In such a case congestion is not present and there is a maximum return on investment.

Where volume is less than capacity, the highway is not being used as much as it could be. Where volume is more than capacity, congestion is present and the highway is being used more than it was designed to be.

Chart 5.1 shows the degrees of congestion, in terms of volume to capacity, that are likely to occur on the freeways, turnpikes, and high and low-type arterials tested with the 1985 plan.[4] The types of development they serve are shown also—i. e., center city, urban, suburban and rural. As the chart indicates, the entire highway system will operate slightly above practical capacity, primarily because of the excessive demands that will be placed on arterials. Both high and low-type arterial highways and streets will still be operating well above practical capacity on an average daily basis in nearly all areas. Local streets in the central business districts will operate by as much as 100 percent over practical capacity. On the other hand, both freeway and turnpike facilities (except for a short suburban section of the Pennsylvania Turnpike) will operate slightly below capacity *on a daily average*, for all area types.

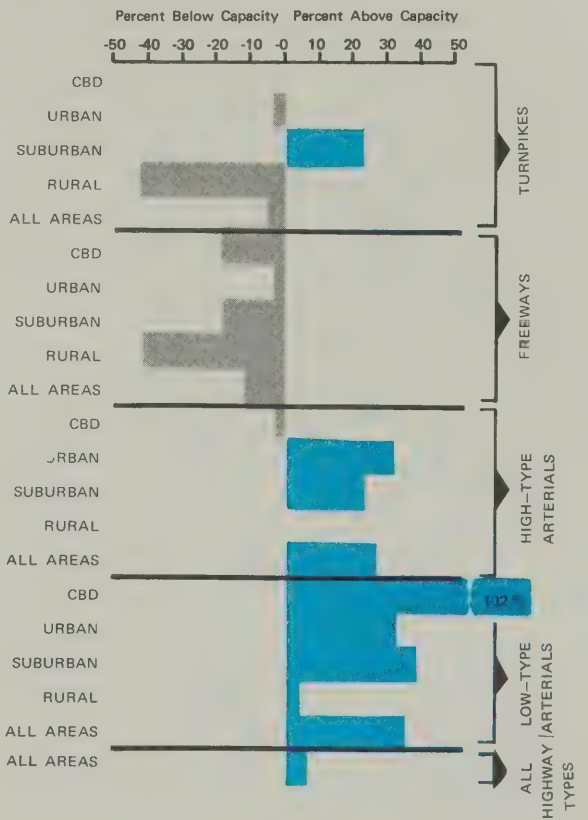
Despite the relief provided by 300 additional miles of limited-access facilities in the 1985 plan, existing urban arterials cannot adequately accommodate 1985 travel demand. Even in tests conducted by DVRPC in which 119 more miles of freeway were provided, the relief supplied was insufficient and congestion remained on the arterials.

DVRPC tests of the systems as they would probably operate, therefore, demonstrate that it is imperative to improve existing arterials. Upgrading of signs and markings, introduction of one-way streets, improvement of signalization, channelization of traffic and other similar devices can be used to obtain a more effective arterial system at minimum cost. In addition, street parking should be eliminated on arterials, especially in the central business districts during rush hours.

[4] Map 5.3 depicts various area types used for highway design criteria. The extent of highway congestion that can be expected in the 1985 highway system is also shown on Map 5.4.

CHART 5.1

EXTENT OF 1985 AVERAGE DAILY HIGHWAY USEAGE ABOVE AND BELOW PRACTICAL CAPACITY-BY AREA AND HIGHWAY TYPES

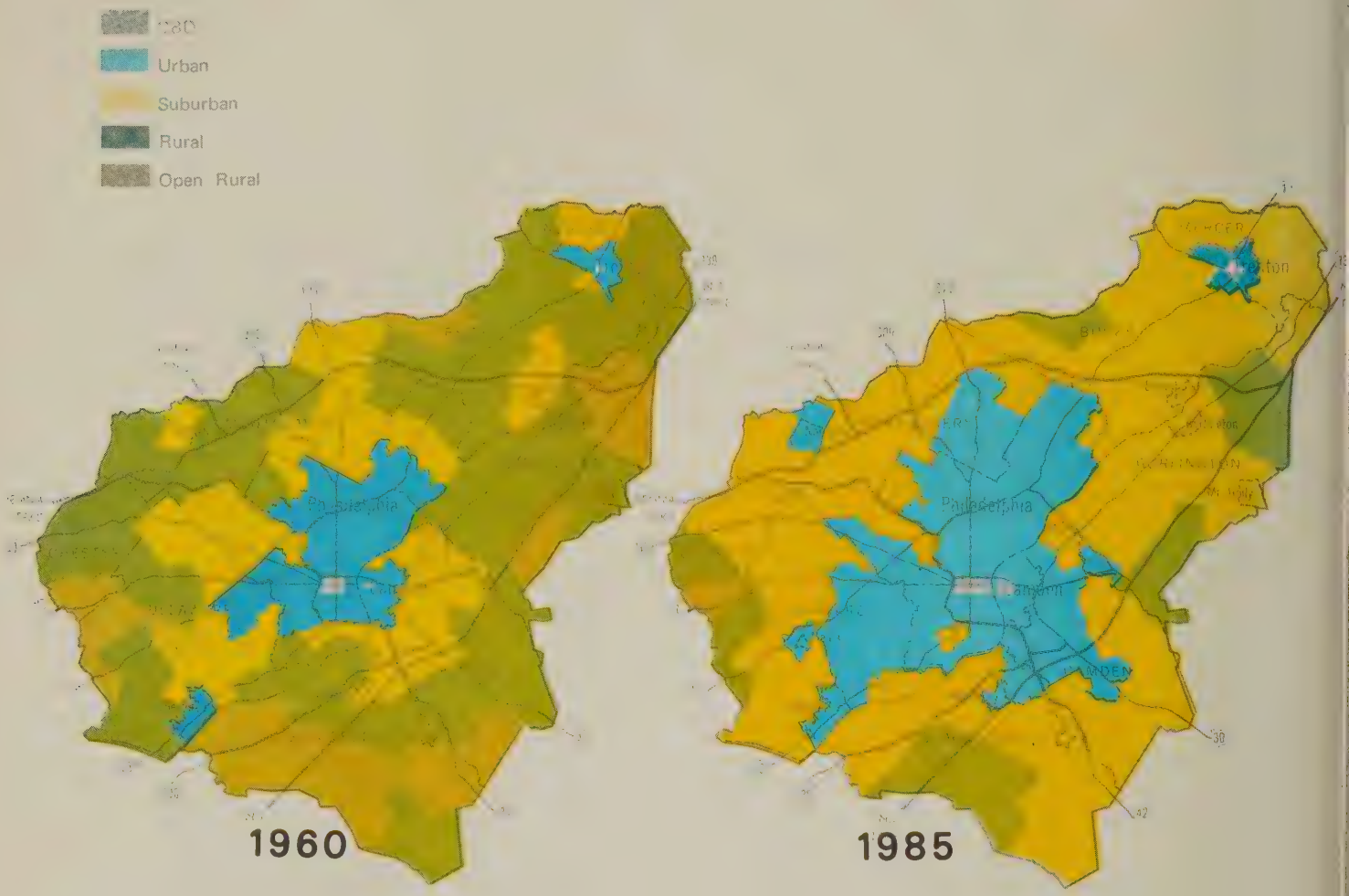


Speeds

Travel speed, the second measure of traffic congestion, is of course the one most familiar to the highway user. The delay caused by lowered speeds is no doubt the most characteristic annoyance suffered by the driver caught in congestion.

MAP 5.3

AREA TYPES FOR HIGHWAY DESIGN CRITERIA



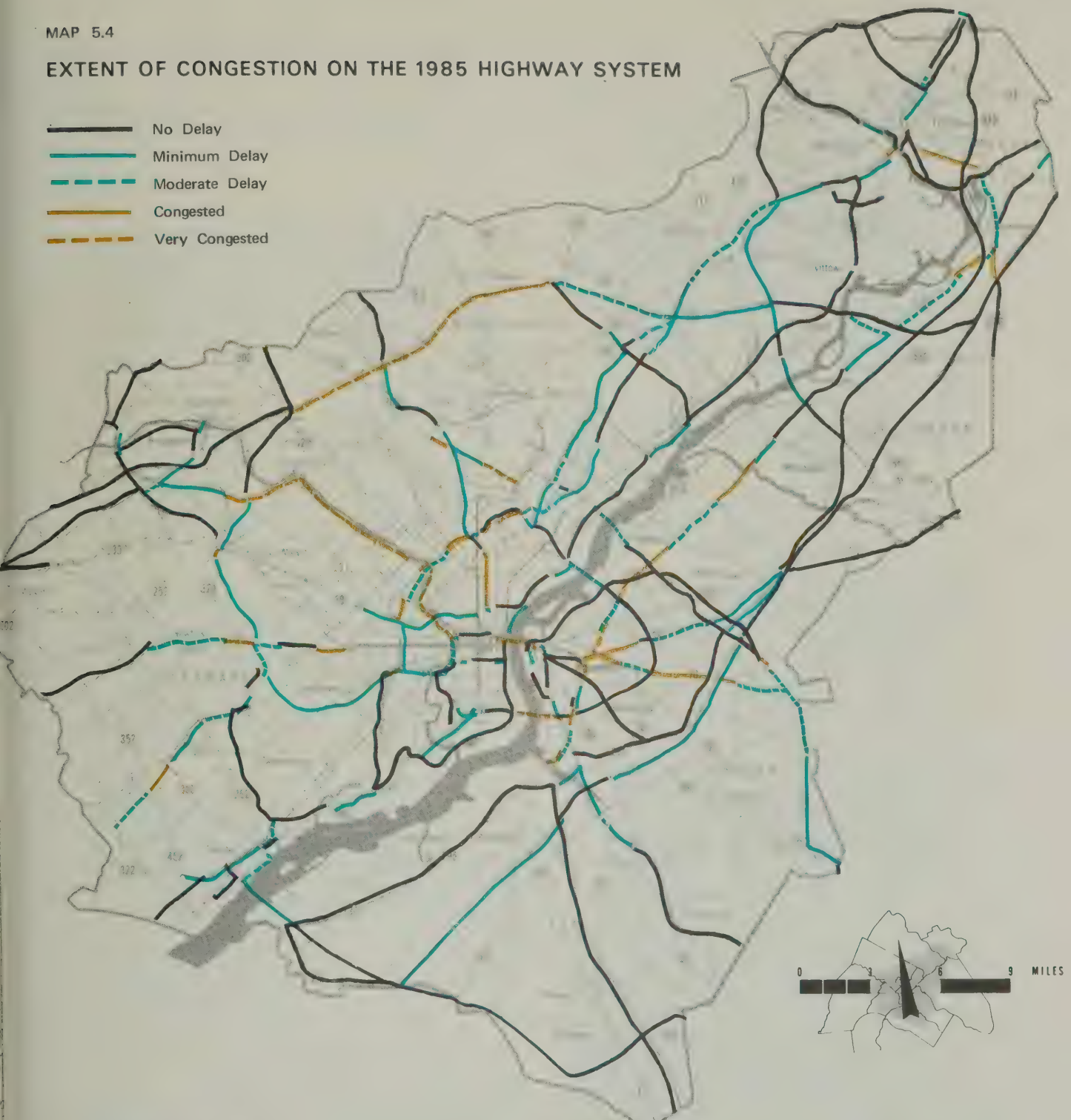
Lowered speeds and increased time delays can result from a number of traffic conditions such as poor weather, road repairs, disabled vehicles and accidents as well as from having too many cars on the road—more volume than capacity. The first four of these conditions cannot be avoided in advance, and neither can the last entirely. But it is this last one which can be measured and its impact estimated for 1985.

As part of the data input to the traffic assignment tests, DVRPC had to establish what it called desirable or "policy" speeds. These amounted to what DVRPC analysts judged to be reasonable increments over 1960 speeds, and provided practical criteria for evaluating 1985 speeds as produced by the simulation process and as affected by traffic congestion.

The difference between these computer-produced speeds and "policy" speeds is a measure of the extent of undue traffic congestion on a highway. In the

MAP 5.4

EXTENT OF CONGESTION ON THE 1985 HIGHWAY SYSTEM



following paragraphs such a comparison is made for each type of highway in terms of both daily speeds and peak-hour speeds.

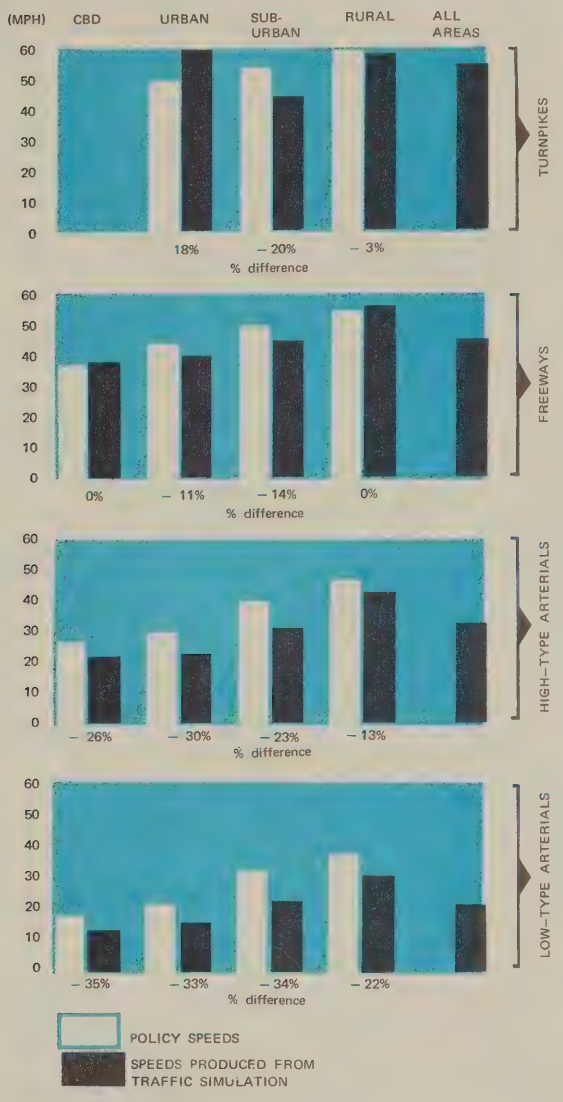
Average Daily Speeds

Chart 5.2 presents average daily speed comparisons for 1985, summarized according to type of area and highway facility. Notice that within *central business districts* average daily speeds compare favorably to policy speeds on all route types except arterials. Here a reduction of speeds from 17 mph to 11 mph (35 percent lower) takes place, reflecting the impact of congestion on traffic movement.

Freeway speeds for the remainder of the *urban area* are slower than policy speeds by as much as 11 percent (39 mph vs. 44 mph); speeds on high-type arterials are slower by as much as 30 percent. Speeds on turnpikes in urban areas, however, are higher than

CHART 5.2

1985 AVERAGE DAILY SPEEDS BY AREA AND HIGHWAY TYPES



policy speeds.

In *suburban areas*, average daily speeds are slower than policy speeds by 20 percent for turnpikes (45 mph vs. 55 mph); 14 percent for freeways (43 mph vs. 50 mph); and 34 percent for low-type arterials (21 mph vs. 32 mph).

Except for turnpikes, average daily speeds on *rural* highways are only slightly lower than policy speeds. (Rural highways constitute 10 percent of total route miles in the cordon area.)

For every type of area, it appears that the lower the level of service provided by a given highway type, the greater is the difference between desirable and actual speeds. In other words, congestion is least severe on turnpikes and freeways and most severe on low-type arterials.

Peak-Hour Speeds

Twice a weekday, once in the morning and once in the evening, disproportionate numbers of trips are made on all modes of transportation. These are home-to-work and work-to-home trips, and they constitute a travel demand far in excess of that which occurs during the rest of the day. Unless enough highway capacity is provided to accommodate this excess peak-hour travel, heavy congestion will result on the region's highways and streets.

This is nowhere better illustrated than on the local streets of the central business districts, many of which struggle with congestion even in off-peak hours. In peak hours, the average speed of center city traffic in 1985 is projected to fall approximately 45 to 50 percent below desirable or policy speeds. Low-type arterial streets are projected to have speeds averaging 7 mph, and high-type arterials 10 mph. Freeways in the central business districts, however, may have 1985 speeds slightly higher than policy speeds, or 34 mph compared to the 25 mph policy level.

In the rest of the *urban sector*, peak-hour speeds will likely be consistently lower than desirable or policy speeds, by as much as 20 percent for freeways and 53 percent for secondary arterials.

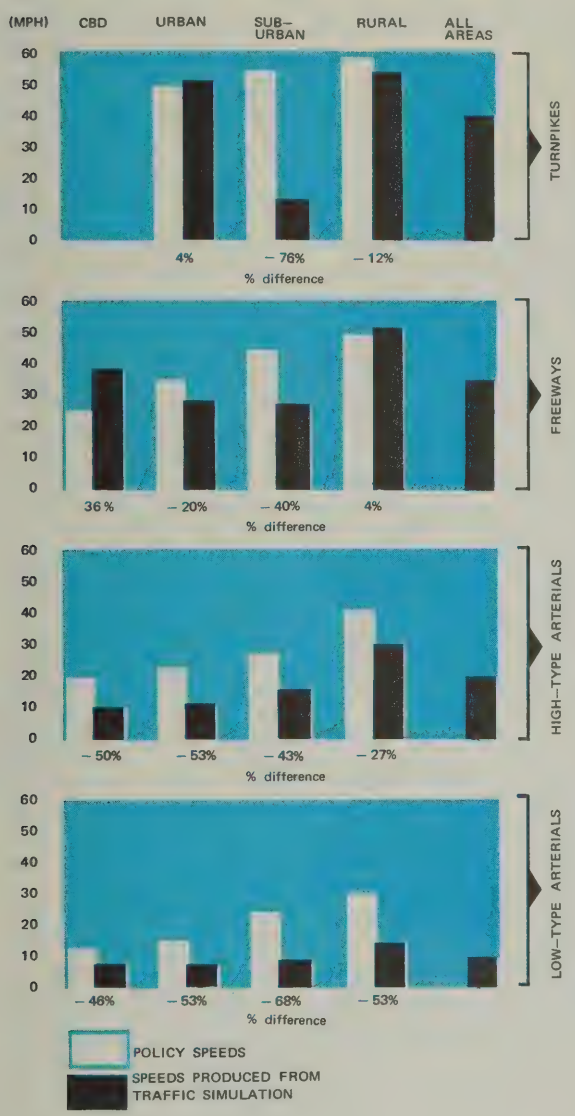
In *suburban areas*, peak-hour speeds are projected to be 40 percent below policy levels for freeways and 76 percent below for turnpikes. A sharp drop in turnpike speeds is expected due to the severe congestion anticipated on the Pennsylvania Turnpike, particularly between US 611 and US 309 Expressway. A high proportion of work trip traffic in that area will likely opt to pay a toll for the privilege of using the Turnpike. Arterial speeds in the suburbs during rush hour are also expected to fall considerably below policy levels to speeds averaging 16 mph for high-type arterials and 8 mph for low-type. Peak-hour speeds projected for 1985 on all highway systems and for all area types are shown on Chart 5.3 and Map 5.5.

Map 5.6 shows 1985 travel time contours from center city Philadelphia. Notice that significant time savings will be realized in the Philadelphia-to-Wilmington and Philadelphia-to-Trenton corridors as a result of Interstate 95. Travel times for longer trips in these corridors will run about 10 to 15 minutes faster in 1985 than in 1960.

Considerable time savings will also be evident in the US 1—Lansdowne Expressway corridor. Time delays along US 30 and the Schuylkill Expressway are

CHART 5.3

1985 PEAK HOUR SPEEDS BY HIGHWAY AND AREA TYPE



expected to be approximately the same as in 1960, reflecting about the same level of congestion that exists today.

Travel on the North-South Freeway and Atlantic City Expressway corridors will likely take longer than in 1960. The shortest travel times in New Jersey will be achieved on I-295.

What all these figures add up to, of course, is the distasteful prospect of continued congestion and travel delays in the Delaware Valley. Even if the entire assortment of expressways recommended in this plan were built by 1985 with their maximum number of lanes, congestion would still prevail on the Pennsylvania Turnpike (if it is not widened) as well as on the region's many arterial highways and local streets. One must realize that arterial and local roadways will likely comprise 75 percent of all highway mileage in the cordon area and will handle about 60 percent of the total miles traveled. So the annoyance of travel delays will continue to be widely experienced, particularly during peak hours, and will remain a fact of urban and suburban life.

It is clear that the values involved in eliminating traffic congestion conflict with other values at some point. To eliminate congestion entirely would involve such high capital and social costs that other programs would have to be sacrificed—programs vital to commerce and industry, to conservation of the natural environment, to a rebuilding of the urban environment, or to a strengthening of the region's human resources.

So there will no doubt be traffic congestion in 1985. If one had to place the blame for this unhappy fact, it would justly rest upon a variety of factors: the region's prosperity; its population increases and economic growth; its residents' fondness for their own private means of travel; and the increasing competition among public needs for limited public fiscal resources.

Still, questions naturally arise in response to the prospect of continued highway congestion. Why not build many more transit facilities to attract peak-hour traffic from highways and onto rail? What about entirely new modes of travel—couldn't innovations in transportation technology solve the congestion problem? Such questions are well taken, and deserve to be discussed in turn.

MAP 5.5

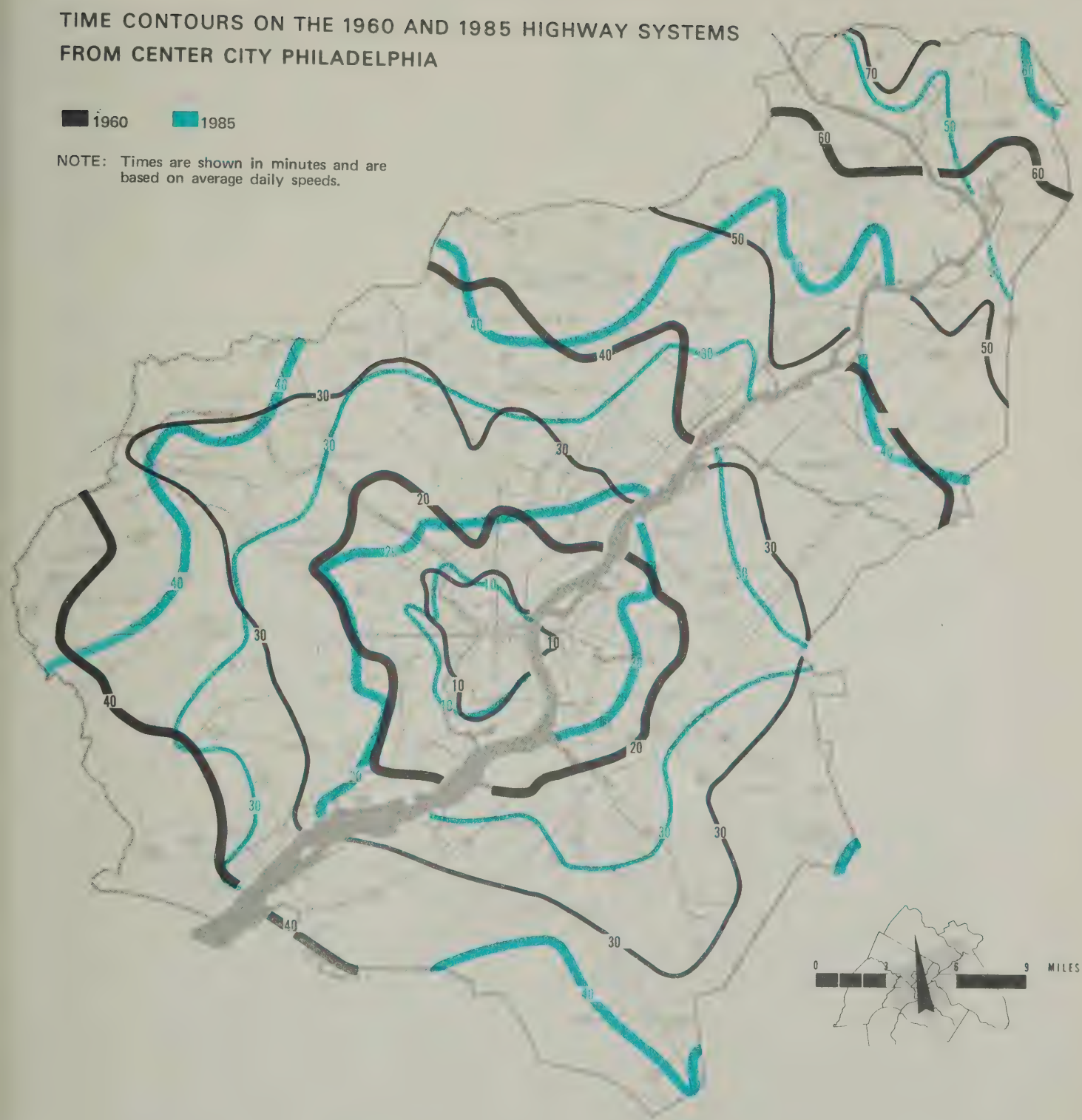
PEAK HOUR SPEEDS ON THE 1985 HIGHWAY SYSTEM

MAP 5.6

TIME CONTOURS ON THE 1960 AND 1985 HIGHWAY SYSTEMS FROM CENTER CITY PHILADELPHIA

1960 1985

NOTE: Times are shown in minutes and are based on average daily speeds.



TRANSIT PERFORMANCE

DVRPC has conducted tests on as many as 116 miles of new high-speed transit facilities (subway-elevated and railroad) lying within the cordon area. This amounts to 92 miles more than is recommended under the plan presented here, and incidentally would cost $710 million more. At one point these additional facilities were tested along with the recommended system; the results indicated that such an extensive network is not economically feasible.[5]

The provision of additional transit facilities, moreover, would not in itself solve peak-hour traffic congestion. There are over 300 miles of commuter railroad and subway-elevated rapid transit lines now in existence. It would seem obvious that transit's ultimate ability to attract peak-hour travellers will principally depend on improving the quality of these services, which is the approach DVRPC has emphasized in its plans. As Table 4.2 indicates, the 1985 plan recommends that as much as $510 million worth of improvements should be made by 1977. These include the purchase of modern cars; improvements to stations, concourses, and scheduling; and provision of park-and-ride lots at stations. Only if such improvements are made will higher speeds, the elimination of delay, and enhanced rider convenience and comfort be possible. These are the prime factors that will determine the performance potential of the 1985 mass transit system.

[5] Certain individual facilities in this network, however, may be economically feasible. They have been selected by DVRPC member governments as being worthy of further testing and analysis, which DVRPC is now undertaking. These facilities are identified in Table 5.1.

INNOVATIONS IN TRANSPORTATION TECHNOLOGY

The many new ideas that have been advanced for "revolutionizing" transportation technology are as overwhelming in variety as they are exciting to the imagination. As dramatic solutions to the transportation needs discussed in this report, they are indeed tantalizing.

Yet, it must be remembered that most of these ideas are still in the conceptual stage; others have only reached the drawing boards; though prototypes have been developed for some, very few have yet been proven operational. And quite understandably, these are not the solutions to all of our transportation ills.

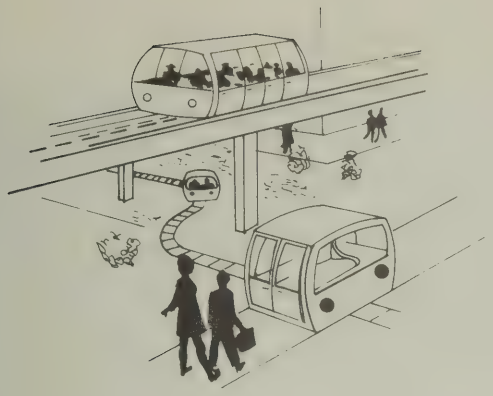
It must also be remembered that tremendous resources are necessary to research and develop these new concepts. Such resources are far beyond those available from any region or even from any state. Realizing the need for action in this field, the Federal Government has undertaken this responsibility through the Secretary of Housing and Urban Development and under the Mass Transportation Act of 1964.

Nearly 300 projects and proposals have been examined and evaluated through grants to industry, research foundations and universities. Included in the studies were such items as exclusive bus lanes, traffic flow control favoring bus operation, dual mode buses, computer scheduling, high-speed rail vehicles, improved fare collection methods, controlled systems, and new concepts in vehicles. Some of the more promising developments are sketched in the accompanying illustrations and are listed here, quoting directly from the HUD report *Tomorrow's Transportation–New Systems of the Urban Future.*

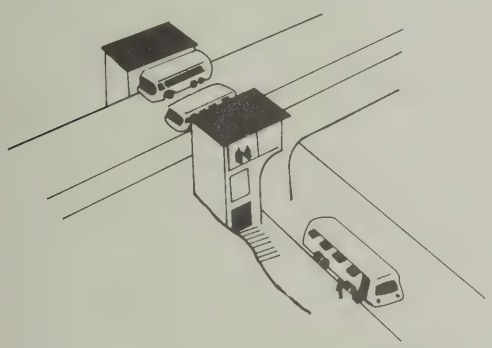
TABLE 5.1

ADDITIONAL TRANSIT FACILITIES BEING TESTED BY DVRPC

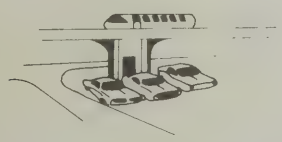
Description	Facility Miles	Cost (Million 1968 Dollars)
Rapid Transit		
Cedarbrook Extension	3.3	49.1
Broomall Extension, Market-Frankford	5.7	63.4
King of Prussia Spur	3.5	16.0
Moorestown-Mt. Holly Line	18.0	67.0
Willingboro-Burlington Spur	9.0	33.0
Northeast Broad Subway to Grant Avenue	1.8	15.6
Railroad		
Center City-Airport Line	5.5	20.0
Norristown Division to Germantown Ave.	2.5	2.9



1. *Dual Mode Vehicle Systems.* Small vehicles which can be individually driven and converted from street travel to travel on automatic guideway networks.

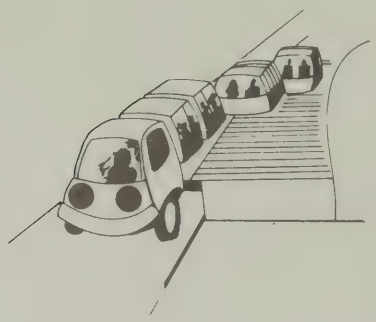


2. *Automated Dual Mode Bus.* A large vehicle system which would combine the high-speed capacity of a rail system operating on its private right-of-way with the flexibility and adaptability of a city bus.

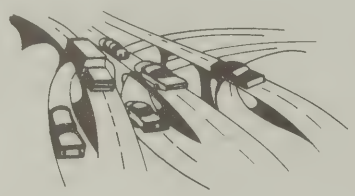


3. *New Systems for Major Activity Centers.* Continuously moving belts, capsule transit systems, some on guideways, perhaps suspended above city streets.

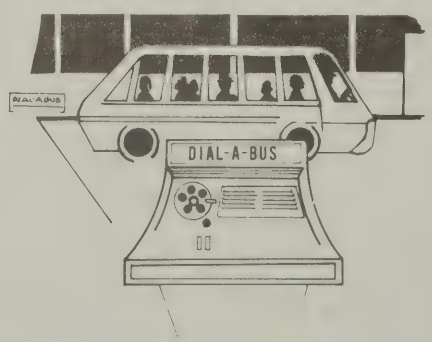
4. *Fast Intraurban Transit Links.* Automatically controlled vehicles capable of operating either independently or coupled into trains, serving metropolitan area travel needs between major urban modes.



5. *Pallet or Ferry Systems.* An alternative to dual mode vehicle systems is the use of pallets to carry (or ferry) conventional automobiles, mini-buses, or freight automatically on high-speed guideways.



6. *Personal Rapid Transit.* Small vehicles, traveling over exclusive right-of-way, automatically routed from origin to destination over a network guideway system, primarily to serve low-to-medium population density areas of a metropolis.



7. *"Dial-a-Bus."* A bus type system activated on demand of the passenger, perhaps by telephone, after which a computer logs the calls, origins, destinations, location of vehicles, number of passengers, and then selects the vehicle and dispatches it.

In 1985 traffic volumes on most center city arterial streets are projected to be twice practical capacity.

The HUD report concludes by saying: "The components and systems discussed in this report do not by any means exhaust the rich array of opportunities for innovation in urban transportation provided by the new systems study, as the forthcoming technical reports will indicate. The recommended research and development program, projected as it is five years into the future, is susceptible to modification as further knowledge is gained."

The implementation of any of these systems in Philadelphia using exclusively or sharing the existing transit corridors is not impossible, and should be considered by the transit industry in light of projected 1985 travel demands.

Many of the futuristic transportation systems cited in HUD research will be seen in this region. The modern automated high-speed transit line to serve Philadelphia, Camden and southern New Jersey with the terminus in Lindenwold is an example. The approved Northeast Extension of the Broad Street subway involves joint use of right-of-way, whereby transit will run in the median of the new Northeast Freeway. A project involving exclusive bus use of a right-of-way is under study for West Chester Pike. If additional freeway capacity is not feasible in certain urban corridors, the application of an improved or entirely new public transportation sub-system may need to be considered as the only means of satisfying the travel demand during morning and evening peak hours.

IN CONCLUSION

A few observations are in order regarding the 1985 plan and the prospects for transportation relief in the region generally.

DVRPC has established two priority periods for completing construction of the recommended freeway system. The first of these ends in 1975 and includes all Interstate highways and proposed Delaware River crossings, as well as certain major freeways. (See Table 5.2.) The aggregate length of these facilities is 221 miles and their combined capital cost is $1.55 billion, estimated in 1968 dollars.

The second priority period is the decade from 1975 to 1985, and calls for the construction of the remaining 80 miles of freeways shown on the plan. (See Table 5.3.) Their aggregate cost, again estimated in 1968 dollars, is an additional $490 million.

These priorities reflect the judgment of the various government agencies involved in transportation planning in the region as to the timing of new facilities. Needless to say, these or any other sets of priorities are subject to change as determined by the actual progress in highway construction, as well as by changing social and political realities.

It is clear, however, that heavy emphasis on highway construction in the next seven years is essential to the region if it is to achieve an integrated highway system capable of providing a reasonable level of accessibility to its urban and suburban communities.

It is also clear that new freeway construction must be accompanied by improvements to existing arterial roads and streets throughout the region. These needs have been described before, but should be underscored here. Upgrading of signs and markings, introduction of one-way streets, improvement of signalization, channelization of traffic and elimination of on-street parking in congested areas are examples of the devices that can be used to provide greater arterial and local street capacity at minimum cost.

Because the continued vitality of the region's urban centers as well as its medium-size and smaller cities is strongly dependent on ready access and free movement of people and goods, ways must be found to arrest the declines in patronage and service which eventually bankrupt public transportation. The private sector which owns and operates much of the region's public transportation network is clearly unable to finance even minor improvements to the existing system, much less to pay for major new facilities. The public sector will very likely need to participate in such undertakings. The door to such commitments has been opened through establishment of the Southeastern Pennsylvania Transportation Authority. This agency, in cooperation with the City of Philadelphia and other public units, together with state and federal assistance, is in a position to finance improvements which would not be possible if we relied solely on the private sector.

SEPTA can also be an effective agency for coordination of transit operations in the region. As SEPTA

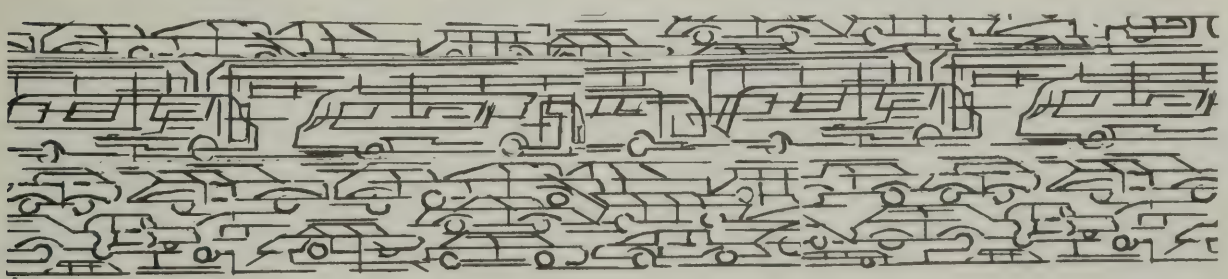


TABLE 5.2

FIRST PRIORITY LIMITED ACCESS HIGHWAYS AND BRIDGES WITHIN CORDON LINE OPEN TO TRAFFIC 1975

Facility	Mileage	Cost in Million 1968 Dollars
Interstate Pennsylvania		
I-76 Schuylkill Expressway Widening	—	4.7
I-76 Vine Street Expressway	1.4	57.5
I-476 Mid County Expressway	22.7	115.1
I-695 Cobbs Creek Expressway	6.9	139.2
I-95 Delaware Expressway	38.9	377.6
SUB-TOTAL	69.9	694.1
Interstate New Jersey		
I-95 Scotch Road to Cordon	1.9	6.0
I-295 South Cordon to U.S. 130	3.4	4.3
I-295 N. J. 38 to North Cordon	28.4	105.0
I-76 Benjamin Franklin Br. to Morgan Boulevard	3.6	23.0
I-195 New Jersey Route 37 Freeway	3.9	7.8
SUB-TOTAL	41.2	146.1
Other Pennsylvania		
Tacony Freeway	3.5	71.6
Northeast Freeway	11.3	82.1
Crosstown Expressway	2.8	85.2
Lansdowne Expressway	5.9	52.2
U.S. 1 Expressway (Pa. Turnpike–U.S. 13)	9.5	23.4
U.S. 13 Expressway	6.9	12.5
U.S. 202 Expressway	10.3	20.3
Norristown Bridge	1.7	9.4
Schuylkill Parkway	4.4	8.1
Schuylkill Expressway Ext. to Pottstown	0.7	2.5
Woodhaven Rd. Ext. to Montg. Co. Line	2.3	9.7
Industrial Expressway–26th St. Connector	4.1	20.9
Burlington Bristol Bridge Approach	2.0	3.1
Chester Bridge Approaches (U. S. 322)	1.0	9.1
County Line Expressway	2.6	5.9
SUB-TOTAL	68.8	416.0
Other New Jersey		
New Jersey 90 Freeway	6.3	42.0
New Jersey 29 Freeway	4.4	26.0
New Jersey 55 Freeway	17.5	26.3
U.S. 322 Expressway	0.9	1.4
U.S. 1 Expressway (N. J. 174)	1.5	4.5
Burlington-Mt. Holly Exp. & Bridge Approaches (I-395)	3.8	5.3
SUB-TOTAL	34.4	105.5
Other Bridges		
Delair Bridge	2.0	69.6
Chester-Bridgeport Bridge	3.1	79.1
Burlington-Bristol Bridge	1.1	39.7
SUB-TOTAL	6.2	188.4

SUMMARY

	Mileage			Cost (Million Dollars)		
	Interstate	Other	Total	Interstate	Other	Total
Pennsylvania	69.9	68.8	138.7	694.1	416.0	1,110.1
New Jersey	41.2	34.4	75.6	146.1	105.5	251.6
Bridges	—	6.2	6.2	—	188.4	188.4
TOTAL	111.1	109.4	220.5	840.2	709.9	1,550.1

TABLE 5.3

SECOND PRIORITY LIMITED ACCESS HIGHWAYS AND BRIDGES WITHIN CORDON LINE OPEN TO TRAFFIC 1985

Other Pennsylvania	Miles	Cost in Million 1968 Dollars
U.S. 309 Expressway	4.5	50.4
West Philadelphia Expressway	4.8	67.5
U.S. 309 Extension to Girard Avenue	3.5	43.9
Mid County Spur	6.0	43.9
Girard Expressway	5.6	112.5
Woodhaven Expressway-Montg. Co. Line to Pa. Turnpike	2.5	10.0
U.S. 1 Expressway (Roosevelt Boulevard Ext.)	3.6	11.8
SUB TOTAL	30.5	339.8
Other New Jersey		
U.S. 322 Expressway	20.0	25.4
U.S. 30 Expressway	6.0	40.2
Camden Inner Loop	8.0	42.9
Camden-Burlington Expressway	3.9	19.5
New Jersey 38 Expressway	8.0	14.4
New Jersey 31 Freeway	4.0	7.9
SUB-TOTAL	49.9	150.3

SUMMARY

	Mileage			Cost (Million Dollars)		
	Interstate	Other	Total	Interstate	Other	Total
Pennsylvania	—	30.5	30.5	—	339.8	339.8
New Jersey	—	49.9	49.9	—	150.3	150.3
Bridges	—	—	—	—	—	—
TOTAL	—	80.4	80.4	—	490.1	490.1

Additive Summary	Mileage	Cost (Million Dollars)
Existing Facilities	213.0	—
First Priority Facilities 1975	220.5	1,550.1
Second Priority Facilities 1985	80.4	490.1
TOTAL	513.9	2,040.2

acquires the privately owned carriers in Pennsylvania and welds them into a single operating entity under one management, operations should become more efficient and full coordination of service and fares should be possible.

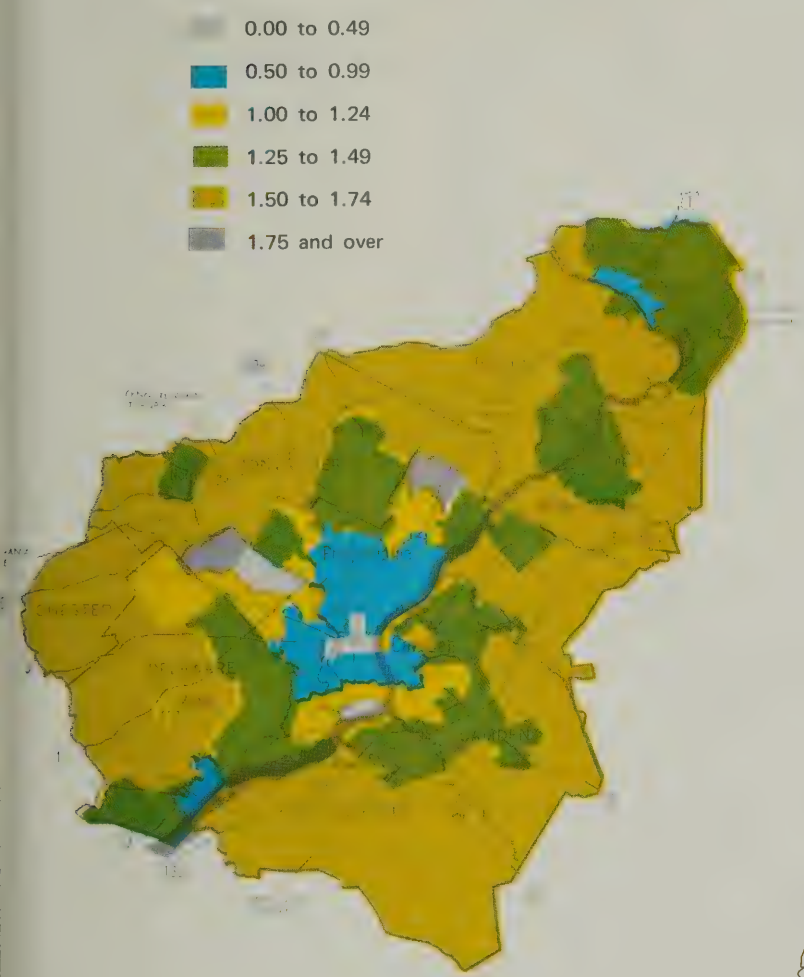
Considering the fact that the public transportation problems of this region are all interrelated and cannot be separated by state boundaries, it is essential that the closest cooperation exist between SEPTA and the transit operations of the Delaware River Port Authority. This cooperation is particularly important now because the DRPA Lindenwold Line will make direct connections with all of Philadelphia's rapid transit lines, as well as with nearly all surface routes serving center city from the east. It assumes even additional importance if DRPA expands its rapid transit operations in Philadelphia or if it expands its high-speed operations into other New Jersey corridors.

The relationships between transportation and development patterns also need to be given continuing attention. In particular, developments throughout the Delaware Valley which will support public transportation should be encouraged. Such patterns are proposed in the *1985 Regional Land Use Plan* (DVRPC Plan Report 2). Reciprocally, it is believed that as the transportation plan recommended here is implemented, better land use patterns will come about.

APPENDIX I

1985 AUTO OWNERSHIP AND TRAVEL PROJECTIONS

MAP A.1 1985 AUTOS OWNED PER HOUSEHOLD BY DATA COLLECTION DISTRICT



MAP A.2 TRAFFIC SIMULATION SECTORS WITHIN CORDON AREA

TABLE A1

1985 AUTOMOBILE OWNERSHIP PROJECTIONS BY COUNTY

	1960		1985		
County	Auto Ownership Rate	Autos Owned (thousands)	Auto Ownership Rate	Autos Owned (thousands)	Percent Increase of Autos Owned 1985/1960
Bucks	1.29	74.4	1.56	180.7	143
Chester	1.46	13.5	1.69	54.1	300
Delaware	1.10	184.6	1.38	321.3	74
Montgomery	1.27	145.0	1.51	273.3	89
Philadelphia	0.65	445.3	0.87	613.1	38
Total Pennsylvania	0.84	862.7	1.14	1,442.6	67
Burlington	1.19	52.7	1.54	145.3	175
Camden	0.99	116.8	1.29	209.3	79
Gloucester	1.12	36.1	1.55	108.0	199
Mercer	1.02	70.3	1.29	114.3	63
Total New Jersey	1.05	275.8	1.39	576.9	109
Cordon Area	0.88	1,138.5	1.20	2,019.5	77

Note: Figures may not add due to rounding.

TABLE A2

1985 AUTOMOBILE OWNERSHIP PROJECTIONS BY SECTOR

Sector	Auto Ownership Rate 1960	Autos Owned 1960 (thousands)	Auto Ownership Rate 1985	Autos Owned 1985 (thousands)	Percent Increase of Autos Owned 1985/1960
1	0.29	7.1	0.35	11.9	67
2	0.45	75.2	0.65	98.3	31
3	0.54	44.7	0.73	56.6	27
4	0.60	86.9	0.84	124.4	43
5	0.80	121.9	1.02	160.3	31
6	0.95	109.4	1.19	161.7	48
Phila.	0.65	445.3	0.87	613.1	38
7	1.30	73.8	1.57	182.5	147
8	1.27	123.5	1.53	244.7	98
9	1.13	220.0	1.41	402.2	83
10	1.23	37.6	1.45	71.7	91
11	1.18	124.1	1.48	283.6	128
12	1.09	55.1	1.50	142.2	158
15	0.68	26.3	0.89	36.8	40
16	0.85	32.7	1.09	42.7	31
Cordon Area	0.88	1,138.5	1.20	2,019.5	77

Figures may not add due to rounding

TABLE A3

1985 PERSON TRIP PROJECTIONS BY TRIP PURPOSE—BY COUNTY
Internal-Internal Plus Internal-External Trip Origins & Percent Increase
(Thousands)

County	Home to Work		Home to Non-Work		Work to Home		Non-Work to Home		Non-Home to Non-Home		Total	
	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960
Bucks	130.7	129	374.6	146	72.6	99	297.5	113	153.0	88	1,028.6	120
Chester	36.8	329	109.7	330	17.3	132	68.6	193	39.4	169	271.8	241
Delaware	245.5	62	643.3	67	157.7	58	579.5	70	331.6	46	1,957.6	63
Montgomery	196.3	93	576.5	100	144.3	69	467.9	65	312.4	50	1,697.4	75
Philadelphia	638.0	17	1,295.5	76	952.5	53	1,599.1	104	1,161.3	80	5,646.4	69
Total Pa.	1,247.3	44	2,999.6	89	1,344.4	57	3,012.6	92	1,997.7	70	10,601.5	75
Burlington	107.0	150	311.6	194	58.6	75	245.1	139	143.8	91	866.0	140
Camden	171.4	61	431.5	70	129.3	50	448.4	81	253.2	52	1,433.8	67
Gloucester	77.3	150	226.3	160	41.5	107	200.1	156	96.7	111	641.9	145
Mercer	90.8	38	228.3	50	92.6	39	259.8	72	152.9	52	824.4	54
Total New Jersey	464.4	82	1,197.6	100	322.0	56	1,153.4	99	646.7	67	3,766.0	87
Cordon Total-1985	1,693.8	52	4,197.2	92	1,666.4	57	4,165.9	94	2,644.3	69	14,367.6	78
1960	1,112.5		2,184.4		1,058.9		2,151.9		1,564.3		8,072.1	

Trips may not add due to rounding.

TABLE A4

1985 PERSON TRIP PROJECTIONS BY TRIP PURPOSE—BY SECTOR
Internal-Internal Plus Internal-External Trip Origins & Percent Increase
(Thousands)

Sector	Home to Work		Home to Non-Work		Work to Home		Non-Work to Home		Non-Home to Non-Home		Total	
	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960
1	20.9	135	111.4	86*	305.0	80	250.0	133	175.6	63	863.0	113
2	124.5	5	167.5	52	166.4	26	256.6	131	217.7	84	932.7	58
3	69.3	7	142.2	98	90.6	50	129.4	113	97.3	101	529.1	73
4	133.1	17	263.7	83	142.6	69	333.6	116	232.3	113	1,105.3	83
5	154.8	22	309.3	52	126.3	40	314.6	75	227.1	72	1,132.1	55
6	135.4	18	301.4	55	121.4	41	314.9	83	211.3	63	1,084.4	56
Philadelphia	638.0	17	1,295.5	76	952.5	53	1,599.1	104	1,161.3	80	5,646.4	69
7	131.9	140	378.3	159	68.2	96	298.6	122	151.4	93	1,028.3	129
8	175.7	89	517.5	98	132.6	78	419.3	73	266.3	56	1,511.4	80
9	301.7	76	808.3	82	191.1	60	695.6	70	418.7	49	2,415.3	69
10	52.6	59	142.5	68	34.5	42	128.0	96	66.5	61	424.1	71
11	212.3	109	599.3	131	105.8	69	523.9	113	283.5	71	1,724.9	106
12	104.6	119	296.4	127	52.4	90	271.0	133	124.2	96	848.6	120
15	38.7	27	73.6	31	71.2	43	98.7	49	86.0	46	368.2	41
16	38.2	17	85.7	27	58.1	37	131.8	54	86.4	46	400.3	39
Cordon Area-1985	1,693.8	52	4,197.2	92	1,666.4	57	4,165.9	94	2,644.3	69	14,367.6	78
1960	1,112.5		2,184.4		1,058.9		2,151.9		1,564.3		8,072.1	

*This percent increase is composed of 1985 trips from permanent households only, similar to the 1960 base data. If 1985 trips from non-permanent households are included, the increase is much higher.

Trips may not add due to rounding.

TABLE A5

1985 TAXI TRIP PROJECTIONS & PERCENT INCREASE BY SECTOR

Sector	1960 Taxi Trips	1985 Taxi Trips	Percent Increase Taxi Trips	Percent Increase Total Person Trips
1	25.5	47.6	87	113
2	15.1	25.5	69	58
3	5.8	10.6	82	73
4	18.9	36.4	92	83
5	7.7	34.7	350	53
6	2.6	5.2	99	56
Philadelphia	75.7	160.1	112	69
7	1.4	5.8	314	129
8	2.7	7.3	170	80
9	6.7	26.2	289	69
10	0.2	0.8	230	71
11	4.2	11.3	172	106
12	2.1	6.9	221	120
15	4.7	12.3	161	41
16	2.2	4.1	81	39
Cordon Area	100.0	234.8	135	78

Note: Trips are rounded to thousands, and therefore may not add.

TABLE A6

1985 TRUCK TRIP PROJECTIONS BY SECTOR
Internal-Internal Plus Internal-External Trip Origins
(Thousands)

Sector	1960 Total Trips	1985 Trips Residential	1985 Trips Non-Residential	1985 Trips Total	Percent Increase
1	42.6	—	102.1	102.1	140
2	128.0	11.9	212.0	223.9	75
3	57.0	23.9	72.5	96.4	69
4	78.9	39.2	109.7	149.0	89
5	102.9	94.7	47.8	143.6	39
6	86.5	54.4	90.0	144.4	67
Philadelphia	496.0	224.1	634.0	858.3	73
7	66.6	110.8	9.1	119.9	80
8	103.4	141.9	17.5	159.4	54
9	131.5	184.0	49.3	233.3	77
10	22.1	38.4	2.0	40.4	83
11	96.8	174.0	—	174.3	80
12	40.1	63.9	18.0	81.9	104
15	33.8	11.0	39.1	50.0	48
16	32.9	7.7	41.7	49.4	50
Cordon Area	1,023.1	956.0	811.0	1,767.0	73

Trips may not add due to rounding.

TABLE A7

1985 TRUCK TRIP PROJECTIONS BY COUNTY
Internal-Internal Plus Internal-External Trip Origins
(Thousands)

County	1960 Total Trips	1985 Trips			Percent Increase
		Residential	Non-Residential	Total	
Bucks	64.3	110.1	9.1	119.2	85
Chester	12.6	28.6	—	28.6	127
Delaware	104.3	137.3	49.3	186.5	79
Montgomery	120.4	160.8	17.5	178.3	48
Philadelphia	496.0	224.1	634.2	858.3	73
Total Pa.	797.6	660.9	710.1	1,370.9	72
Burlington	45.6	85.2	—	85.2	87
Camden	99.2	122.4	39.1	161.5	63
Gloucester	25.9	41.7	18.0	59.7	130
Mercer	55.9	46.0	43.7	89.8	63
Total New Jersey	226.6	295.3	100.8	396.2	75
Cordon Area	1,023.1	956.0	811.0	1,767.0	73

Trips may not add due to rounding.

TABLE A-8

ESTIMATED 1985 TRANSIT TRIP ORIGINS BY SECTOR

Sector	Transit Trips (Thousands)		Percent Increase		Percent of Person Trips Using Transit	
	1960	1985	Transit Trips	Total Trips	1960	1985
1	231	324	40	113	57	38
2	223	242	8	58	38	26
3	99	108	9	73	32	20
4	183	240	31	83	30	22
5	171	228	34	55	23	20
6	112	153	37	56	16	14
7	9	28	202	129	2	3
8	39	78	101	80	5	5
9	105	170	62	69	7	7
10	6	17	171	71	2	4
11	30	88	195	106	4	5
12	15	36	145	120	4	4
15	42	61	46	41	16	17
16	19	31	65	39	6	8
Total	1,283	1,803	40	78	16	13

Note: Trips may not add due to rounding.

TABLE A9

1985 TRANSIT TRIP PROJECTIONS AND PERCENT INCREASE BY TRIP PURPOSE—BY SECTOR

Internal-Internal Trip Origins (Thousands)

	Home to Work		Home to Non-Work		Work to Home		Non-Work to Home		Non-Home to Non-Home		Total	
Sector	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960
1	7.5	41	7.1	50	167.0	35	90.9	47	52.2	46	323.9	40
2	65.6	4	50.8	1	58.9	9	43.8	5	22.5	69	241.6	8
3	34.3	7	25.7	— 4	22.3	16	17.0	1	8.9	90	108.1	9
4	61.5	12	53.5	12	49.1	55	52.5	47	23.1	88	239.7	31
5	70.8	33	54.1	23	39.6	40	42.8	19	21.0	122	228.3	34
6	44.8	20	35.7	27	29.0	42	29.8	43	14.0	154	153.4	37
Philadelphia	284.6	16	226.9	9	365.8	32	275.9	30	141.8	75	1,295.0	27
7	11.6	168	7.7	244	2.6	223	3.7	204	1.2	267	27.6	202
8	22.2	66	20.2	138	12.3	69	14.5	121	8.6	191	77.8	101
9	55.8	55	50.3	93	23.7	54	30.0	37	9.9	77	169.6	62
10	6.1	195	5.2	159	2.3	102	2.6	286	0.5	80	16.6	171
11	30.5	130	24.0	199	8.5	136	12.2	227	12.4	1036	87.6	195
12	13.5	111	10.7	138	3.2	166	4.3	110	4.4	672	36.0	145
15	14.5	39	11.7	36	16.7	145	12.4	51	6.1	80	61.3	46
16	5.7	39	6.5	73	8.4	185	8.4	62	2.2	70	31.2	65
Cordon Area	444.3	32	363.1	35	443.5	37	364.0	39	187.9	94	1,802.8	40

Trips may not add due to rounding.

TABLE A10

1985 TRANSIT TRIP PROJECTIONS BY SUB-MODE AND SECTOR (Thousands)

	Railroad			Sub-El			Surface			Total		
Sector	1960 Trips	1985 Trips	Percent Increase	1960 Trips	1985 Trips	Percent Increase	1960 Trips	1985 Trips	Percent Increase	1960 Trips	1985 Trips	Percent Increase
1	30.1	56.3	87	94.5	142.2	50	106.5	125.4	18	231.2	323.9	40
2	3.6	3.9	8	71.2	85.7	20	148.0	152.0	3	222.8	241.6	8
3	.6	.5	— 21	25.9	41.2	59	73.0	66.4	— 9	99.4	108.1	9
4	6.3	7.0	11	58.8	85.1	45	117.5	147.6	26	182.6	239.7	31
5	8.0	12.3	54	55.6	91.8	65	107.3	124.3	16	170.8	228.3	34
6	1.9	2.5	28	43.9	80.5	84	66.4	20.3	—69	112.2	153.4	37
Philadelphia Total	50.5	82.4	63	349.9	526.5	51	618.8	686.0	11	1,019.1	1,295.0	27
7	2.6	6.6	155	2.4	7.2	206	4.2	13.8	229	9.1	27.6	202
8	11.5	20.8	82	7.0	13.1	87	20.2	43.8	118	38.6	77.8	101
9	18.2	30.1	66	22.9	43.5	90	63.8	96.0	50	104.9	169.6	62
Other Pennsylvania Total	32.3	57.6	79	32.2	63.8	98	88.2	153.6	74	152.7	275.0	80
10	.2	.2	— 9	—	.9	*	5.9	15.5	163	6.1	16.6	171
11	.8	.9	11	2.3	24.9	*	26.7	61.8	132	29.8	87.6	195
12	.3	.2	—16	1.2	6.8	*	13.2	29.0	120	14.7	36.0	45
15	.4	.4	—11	4.8	13.2	176	37.0	47.8	29	42.1	61.3	46
16	.6	.4	—32	—	1.2	*	18.2	29.6	62	18.9	31.2	65
New Jersey Total	2.4	2.2	— 9	8.3	46.9	*	100.9	183.7	82	111.6	232.8	109
Grand Total	85.2	142.2	67	390.4	637.2	63	809.8	1,023.3	27	1,283.4	1,802.8	40

* Increase is excess of 400 percent.

Totals may not add due to rounding.

TABLE A11

1985 AUTO DRIVER TRIP PROJECTIONS AND PERCENT INCREASE BY TRIP PURPOSE—BY SECTOR
Internal-Internal Plus Internal-External Trip Origins
(Thousands)

	Home to Work		Home to Non-Work		Work to Home		Non-Work to Home		Non-Home to Non-Home		Total	
Sector	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960	Trips	Percent Increase from 1960
1	10.8	313	60.3	100*	113.1	219	93.3	250	96.4	75	373.9	203
2	47.5	20	67.4	107	88.1	39	124.1	212	152.5	74	479.6	83
3	28.2	13	67.3	183	56.2	76	65.5	183	69.1	98	286.4	106
4	57.8	28	121.5	131	76.7	75	163.9	135	163.4	117	583.2	103
5	67.7	13	147.5	71	71.1	43	158.5	90	161.0	67	605.8	61
6	73.1	18	153.6	68	75.7	47	166.2	93	154.1	66	622.7	62
Philadelphia	285.0	22	617.7	113	480.9	75	771.5	134	795.5	80	2,951.6	88
7	97.1	133	214.2	155	53.7	89	172.0	120	116.7	101	653.6	125
8	123.8	90	287.5	94	98.6	82	236.0	70	201.3	53	947.2	76
9	198.3	83	438.1	81	137.2	67	388.1	71	319.4	50	1,481.2	70
10	37.5	54	79.4	70	26.4	47	73.1	95	51.6	57	268.0	70
11	146.6	109	332.5	133	79.7	68	298.3	116	211.9	71	1,069.1	105
12	73.5	126	165.2	133	40.3	90	155.5	141	93.6	101	528.1	124
15	19.5	34	35.8	39	44.7	56	50.3	50	62.4	50	212.8	48
16	26.2	28	45.8	26	40.7	43	72.0	48	65.8	52	250.5	41
Cordon Area	1,007.6	65	2,216.2	104	1,002.4	72	2,216.9	102	1,919.1	70	8,362.2	85

Trips may not add due to rounding.

* This percent increase is composed of 1985 trips from permanent households only, similar to the 1960 base data.

If 1985 trips from non-permanent households are included, the increase is much higher.

TABLE A12

EXTERNAL-INTERNAL AND THROUGH TRIPS AUTO DRIVER AND TRUCK—BY COUNTY
(Thousands)

	Auto Driver			Truck		
County of Entrance	1960 Trips	1985 Trips	Percent Increase	1960 Trips	1985 Trips	Percent Increase
External—Internal Trips						
Bucks	12.1	39.7	227	1.9	5.7	195
Chester	17.2	47.2	175	3.7	8.5	336
Delaware	19.8	51.1	158	3.6	9.8	175
Montgomery	50.6	17.1	131	7.6	15.2	101
Pennsylvania Total	99.7	255.2	156	16.8	39.2	134
Burlington	25.7	71.7	180	3.2	8.3	156
Camden	9.6	32.9	242	1.5	3.2	111
Gloucester	25.1	70.2	180	4.5	10.6	134
Mercer	38.4	106.7	178	7.6	19.8	161
New Jersey Total	98.7	281.5	185	16.9	41.9	148
Total Region	198.5	536.8	170	33.7	81.2	141
Through Trips						
Bucks	0.4	1.8	348	0.1	0.7	33
Chester	4.3	10.7	146	0.9	1.5	67
Delaware	1.1	5.2	353	0.3	1.3	358
Montgomery	4.5	9.4	106	1.0	2.4	140
Pennsylvania Total	10.4	27.0	159	2.3	6.0	162
Burlington	2.6	6.7	161	0.6	1.7	202
Camden	0.7	2.2	213	0.2	0.7	317
Gloucester	8.6	20.7	139	3.0	5.6	89
Mercer	13.0	35.3	172	4.1	6.1	47
New Jersey Total	24.9	64.9	159	7.8	14.1	80
Total Region	35.3	91.9	161	10.1	20.1	99

Trips have been rounded to thousands, and therefore may not add.

Percent increases are based on unrounded trips.

TABLE A 13

SUMMARIES OF HIGHWAY TRIP DISTRIBUTION 1960 AND 1985 (Thousands)

Trip Type	1960 Trips* Total Trips	1960 Trips* Intra-Dist. Trips	1960 Trips* River Crossings	1985 Trips* Total Trips	1985 Trips* Intra-Dist. Trips	1985 Trips* River Crossings
I-Internal—Internal						
A-Auto Driver						
1. H-W	574.8	84.6	39.7	915.5	118.1	97.9
2. H-NW	1,022.8	384.2	23.8	2,026.3	661.1	59.8
3. W-H	549.0	81.7	39.2	914.8	130.5	96.2
4. NW-H	1,048.1	393.6	25.3	2,049.6	680.7	56.9
5. NH-NH	1,114.1	384.0	30.2	1,919.1	588.5	47.1
All Purposes	4,308.8	1,328.0	158.3	7,825.3	2,178.8	357.9
B. Truck	989.8	535.7	15.7	1,685.3	830.1	31.3
C. Taxi	100.0	29.2	0.9	234.8	55.8	3.5
Sub-Total	5,398.6	1,892.8	174.8	9,745.8	3,064.7	392.7
II-External—Internal						
A. Auto Driver						
1. H-W	39.4	—	4.0	87.7	—	8.5
2. All Purposes	198.5	—	25.5	536.7	—	80.4
B. Trucks	33.7	—	5.4	81.2	—	18.4
Sub-Total	232.2	—	30.9	617.9	—	98.8
III-Internal—External						
Sub-Total	232.2	—	30.9	617.9	—	98.8
IV-External—External						
A. Autos	35.4	—	—	91.9	—	—
B. Trucks	10.1	—	—	20.1	—	—
Sub-Total	45.5	—	—	112.0	—	—
Grand Total	5,908.5	1,892.8	236.6	11,093.6	3,064.7	590.3

* Trips are rounded to nearest thousands and therefore may not add.

TABLE A 14

SUMMARIES OF TRANSIT TRIP DISTRIBUTION 1960 AND 1985 (Thousands)

Trip Type	1960 Trips* Total Trips	1960 Trips* Intra-Dist. Trips	1960 Trips* River Crossings	1985 Trips* Total Trips	1985 Trips* Intra-Dist. Trips	1985 Trips* River Crossings
Transit						
Internal—Internal						
H-W	336.3	13.2	20.3	444.3	15.5	48.1
H-NW	265.5	29.6	7.8	363.1	30.3	25.9
W-H	323.3	12.0	20.1	443.5	15.3	49.0
NW-H	261.6	28.4	7.5	364.0	30.4	24.3
NH-NH	96.8	6.7	5.7	187.9	11.9	18.6
Total Transit	1,283.4	89.7	61.4	1,802.8	103.4	165.9
Railroad— External—Internal	24.1			42.6		

* Trips are rounded to the nearest thousand, and therefore may not add.

APPENDIX II

PASSENGER VOLUMES AND TRAVEL TIMES ON THE 1985 TRANSIT PLAN

MAP A.3

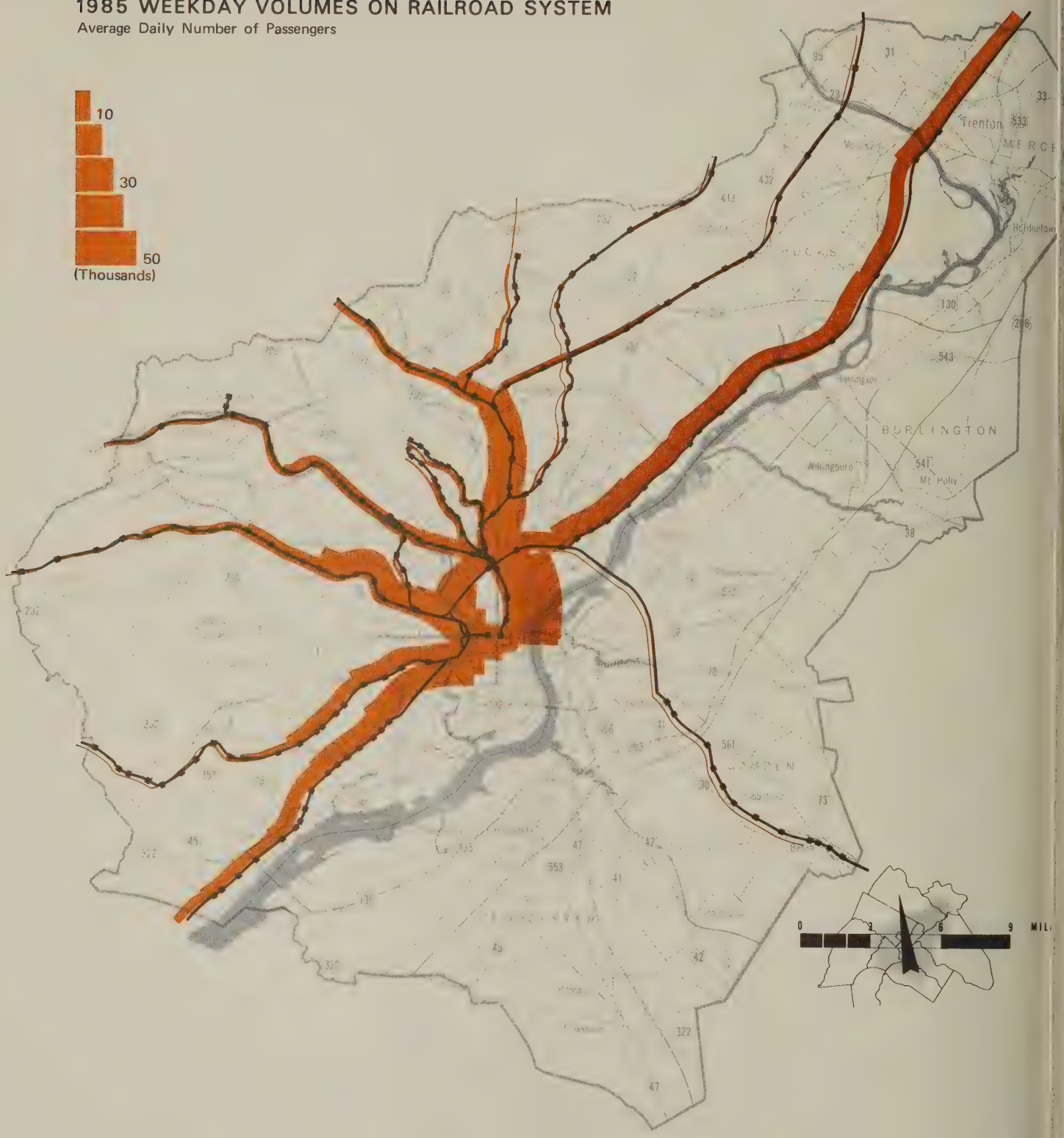
1985 WEEKDAY VOLUMES ON SUBWAY–ELEVATED SYSTEM

Average Daily Number of Passengers

MAP A.4

1985 WEEKDAY VOLUMES ON RAILROAD SYSTEM

Average Daily Number of Passengers

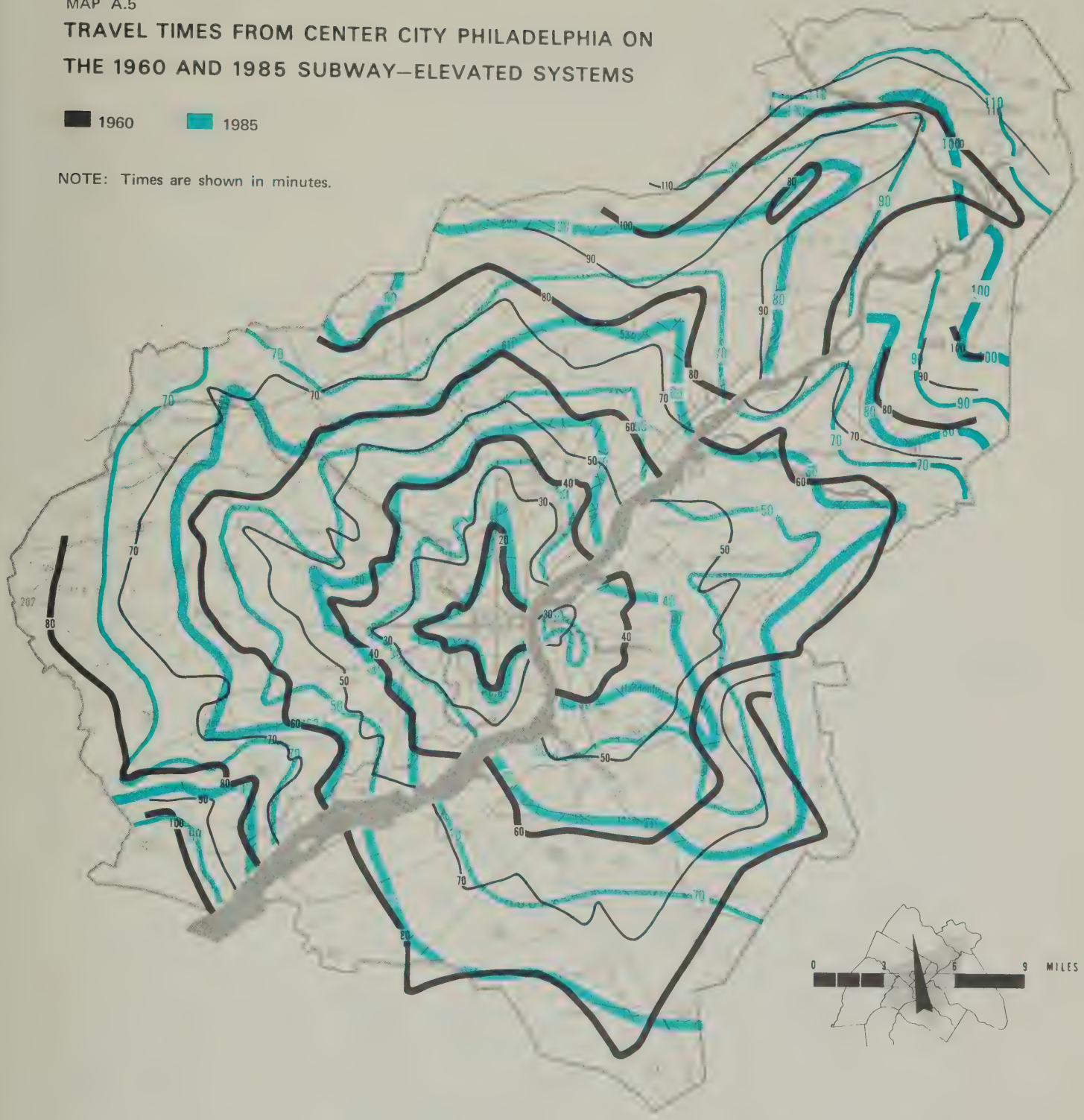


MAP A.5

TRAVEL TIMES FROM CENTER CITY PHILADELPHIA ON THE 1960 AND 1985 SUBWAY–ELEVATED SYSTEMS

1960 1985

NOTE: Times are shown in minutes.



NOTE: Times shown reflect the use of supporting surface routes in conjunction with the subway-elevated system.

MAP A.6

TRAVEL TIMES FROM CENTER CITY PHILADELPHIA ON THE 1960 AND 1985 RAILROAD SYSTEMS

NOTE: Times are shown in minutes.

1960 1985

The photographs used in this report are courtesy of:

Jose Berguido (pp. 6, 7, 12, 31, 32)
Philadelphia City Planning Commission (pp. 8, 45, 50)
Philadelphia Department of Public Property (pp. 12, 13, 18)
Delaware River Port Authority (pp. 21, 25, 26)
Skyphotos (p. 24)

COMMISSION STAFF

WALTER K. JOHNSON, *Executive Director*

DAVID B. KLOTZ, *Deputy Director*
ROBERT W. STABE, *Executive Assistant*
RICHARD E. HUBBELL, *Director, Transportation Planning*
THOMAS B. MULRONEY, JR., *Administrator*
ROBERT C. FOLWELL, *Communications Director*
EDWARD J. McNICHOL, *Data Operations Director*
GENE G. GOMOLKA, *Director, Data Services and Mapping*
ANTHONY R. TOMAZINIS, *Consultant, Transportation Planning*
DAVID LAMONT, *Graphics and Reproduction Director*
PETER S. ROBINSON, *Publications Editor*

Planning Analysts

KENNETH O. SHEPARD
EDWARD A. MILLER
JACK NELSON
HAROLD OXMAN
JAMES R. WESTKOTT
JOHN E. BLAIR
HANKA GORSKA
ALBERT POLS
MARIO S. STEGOSSI
JOSE BERGUIDO, JR.
JERRY A. GRAY
JAMES F. McLAUGHLIN
ARNOLD G. PINSLEY
RONI E. GORDON
CAROL A. McCONOCHIE
*ABE GOTTLIEB
*THABET ZAKARIA

Technical Planning Assistants

ROGER A. SMITH
LAURENCE F. DAKE
ARNO F. MEYER
LOUISE AUGER
ANTHWAUN L. BURKE

Planning Intern

STEVEN ARBITMAN

*Former Member

Computer Programmers

JOSEPH F. McGRATH
DAVID A. EVANS
DANIEL P. HARTNETT
JOSEPH F. SCHIERSE
ANNA M. SMITH

Computer Operators and Data Processing Aides

JOSEPH F. MARTIN
ALFRED F. SPARANO
ELSIE SMITH
CATHY L. GAMBLER
AGNES S. SMITH

Graphics and Reproduction

JOHN J. O'REILLY
PATRICIA D. BROWN
C. IRIS MASSEY
SUSAN GEROULD
DANTE J. J. BEVILACQUA
GEORGE T. GOINS
MARLIN E. WICKNICK

Clerical Assistants

THOMAS J. CARPENTER
BELLE GROSSMAN
MARGARET KEENAN
JULIA M. LARICCIA
ANN E. McCOY
MARJORIE C. SCULLY
IRENE F. ATWELL
DOLORES A. BEINE
MAGDALENE E. BERGUIDO
VIOLA FRANKLIN
FRANCES SANTANIELLO
LYNNE R. LUBAR
NORMA W. SCHULTZ
JOANNE M. WEAVER

Transportation Engineers

WALTER D. McCARTHY
ROBERT J. PORTER
WILLIAM F. WEIGAND
GERALD J. GAUSCH
FRANK S. McHUGH
*JOHN C. FALCOCCHIO

Transportation Engineering Assistants

STEPHEN M. ESCHER, Jr.
JOHN CRAIG
STEPHEN CHARYSH
ALEXANDER COIA
VINCENT J. DONATO
JAN LEVIT
GEORGE E. MENOHER
MAUREEN A. LYNCH

Administration

CHARLES J. GRANDE
ALBERT H. HAZLETT
JAMES B. LITTRELL

Secretaries and Stenographers

GERTRUDE S. TRULEAR
AMY REILLY
BETTIE L. COLEY
KATHRYN DE MARCO
JUDITH L. FEDERICO
LYNN FELSHER
WILHELMINE K. SCHROEDER
ROSE SOMMER
GERTRUDE SOSH

ACKNOWLEDGMENTS

Many organizations and individuals gave generously of their time and talents in assisting the transportation planning program of the Delaware Valley Regional Planning Commission. Special mention must be made of those public officials and others who, in addition to their normal duties, served on DVRPC's Planning Coordinating Committee and Technical Advisory Committees on Highway and Transit Plans.

PLANNING COORDINATING COMMITTEE

Pennsylvania Department of Highways George R. Britton (Chairman), Director, Bureau of Planning Statistics; Jack Kinstlinger, Director, Bureau of Advance Planning; †Joseph R. McMurtry, Director, Bureau of Advance Planning; Lambert J. Jaroska, Bureau of Advance Planning; George Varvoutis, District Planning Coordinator, Engineering District 6-0 **Pennsylvania State Planning Board** Irving Hand, Executive Director; Richard B. Fernbach, Chief, Advance Planning Division **New Jersey Department of Transportation** Vincent C. Berberich, Supervising Engineer, Bureau of Urban Planning; †Robert A. Engle, Supervising Engineer, Bureau of Statistics **New Jersey Department of Community Affairs** Paul N. Ylvisaker, Commissioner of Community Affairs; Donald H. Stansfield, Chief, Bureau of Statewide Planning **Bucks County** Franklin C. Wood, Executive Director, County Planning Commission; †James S. Carr, Assistant Director, County Planning Commission **Chester County** Richard P. Byler, County Planner, County Planning Commission **Delaware County** W. James Graef, Jr., Executive Director, County Planning Commission **Montgomery County** Arthur F. Loeben, Director, County Planning Commission; Howard J. Grossman, Assistant Director, County Planning Commission **Burlington County** Bernard Cedar (Vice Chairman), Director, County Planning Board; ‡Hugh R. Frost, Aide to the Director **Camden County** John D. Tomaselli, Planning Director, County Planning Board; Mahadeveyya Guruswamy, Principal Planner, County Planning Board; †Michael Blake, Senior Planner, County Planning Board **Gloucester County** John H. Fisher, III, Director, County Planning Department **Mercer County** Leo Laaksonen, County Planning Engineer, County Planning Board; †Louis A. Calvanelli, County Planning Engineer, County Planning Board **City of Chester** Ferdinand L. Vari, Director of Planning, Redevelopment Authority; Dwight M. Burkam, Planner I, Redevelopment Authority **City of Philadelphia** Edmund N. Bacon, Executive Director, City Planning Commission; Robert Paternoster, Chief, Comprehensive Planning Division **City of Camden** Willard Cooper, Coordinator, Office of Planning and Renewal **City of Trenton** Charles C. Nathanson, Director, Planning and Development ****U. S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads: Pennsylvania Division** Roger E. Borg, Planning and Research Engineer; †Charles M. Gerdes, Planning and Research Engineer; †John L. Balshaw, Assistant Planning and Research Engineer; **New Jersey Division** William Schmitt, Jr., Planning and Research Engineer; Paul W. Lenk, Assistant Planning and Research Engineer; †Bruce E. Cannon, Assistant Planning and Research Engineer ****U. S. Department of Housing and Urban Development, Region II** William L. Kaplan, Regional Director of Planning; Michael J. Stomackin, Urban Planner, Planning Branch

TECHNICAL ADVISORY COMMITTEE ON HIGHWAY PLANS

Pennsylvania Department of Highways George Varvoutis, District Planning Coordinator, Engineering District 6-0 **New Jersey Department of Transportation** Robert A. Engle (Chairman), Supervising Engineer, Bureau of Statistics **U. S. Bureau of Public Roads, Pennsylvania Division** Roger E. Borg, Planning and Research Engineer; †Charles M. Gerdes, Planning and Research Engineer; †John L. Balshaw, Assistant Planning and Research Engineer **U. S. Bureau of Public Roads, New Jersey Division** William Schmitt, Jr., Planning and Research Engineer; Paul W. Lenk, Assistant Planning and Research Engineer; †Bruce E. Cannon, Assistant Planning and Research Engineer **Pennsylvania State Planning Board** Richard B. Fernbach, Chief, Advance Planning Division **Bucks County** Allen Lewis, Principal Planner, County Planning Commission; †James S. Carr, Assistant Director, County Planning Commission **Chester County** Richard P. Byler (Vice Chairman), County Planner, County Planning Commission **Delaware County** W. James Graef, Jr., Executive Director, County Planning Commission **Montgomery County** Frederic T. Dannerth, Principal Planner, County Planning Commission; Curtis O. Campman, Director, County Roads and Bridges Department **Burlington County** James Logan, Sr., Transportation Consultant **Camden County** Mahadeveyya Guruswamy, Principal Planner, County Planning Board **Gloucester County** John H. Fisher, III, Director, County Planning Board **Mercer County** Leo Laaksonen, County Planning Engineer, County Planning Board; †Louis A. Calvanelli, County Planning Engineer, County Planning Board **City of Chester** Ferdinand L. Vari, Director of Planning, Redevelopment Authority; Dwight M. Burkam, Planner I, Redevelopment Authority **City of Philadelphia** David M. Smallwood, Commissioner, Department of Streets; Lawrence M. Moy, Survey and Design, Department of Streets **City of Camden** Willard Cooper, Coordinator, Office of Planning and Renewal **City of Trenton** William Bartels, Traffic Engineer, Bureau of Traffic and Lighting

TECHNICAL ADVISORY COMMITTEE ON TRANSIT PLANS

Pennsylvania Department of Highways William H. Polk, Special Assistant for Mass Transportation; George Varvoutis, District Planning Coordinator, Engineering District 6-0 **Pennsylvania Department of Community Affairs** Edwin Bickhart, Chief, Mass Transportation Division **Pennsylvania State Planning Board** Richard B. Fernbach, Chief, Advance Planning Division **New Jersey Department of Transportation** Robert A. Engle, Supervising Engineer, Bureau of Statistics **U. S. Department of Housing and Urban Development, Region II** Michael J. Stomackin, Urban Planner, Planning Branch **Southeastern Pennsylvania Transportation Authority** Anthony R. Sloan, Planning Chief; Harry L. Parrish, Special Assistant to the General Manager **City of Philadelphia, Department of Public Property** Edson L. Tennyson (Chairman), Deputy Commissioner for Transit Engineering; Robert M. Stacy, Transit Engineer; S. Robert Rubin, Transit Analyst **Representative of Pennsylvania Local Governments** Frederic T. Dannerth, Principal Planner, Montgomery County Planning Commission **Representative of New Jersey Local Governments** Willard Cooper, Coordinator, Office of Planning and Renewal, City of Camden **Delaware River Port Authority** Paul T. Osisek (Vice Chairman), Civil Engineer, Project Planning Department

**Non-voting members.
†Former Member.
‡Deceased.

THE COMMISSION

BOARD MEMBERS AND ALTERNATES**

Officers for FY 1968-69

ELKINS WETHERILL, *Chairman*
DAVID J. GOLDBERG, *Vice-Chairman*
PAUL R. ANAPOL, *Secretary*
FRANK C. P. McGLINN, *Treasurer*

*Pennsylvania Department of Highways

ROBERT G. BARTLETT, *Secretary of Highways*
ERIC J. VON HAUSSWOLFF, *Deputy Secretary for Planning and Programming*

*Pennsylvania State Planning Board

IRVING HAND, *Executive Director*

*Pennsylvania Governor's Appointee

FRANK C. P. McGLINN, *Senior Vice President,* The Fidelity Bank, Philadelphia

City of Chester

JOHN H. NACRELLI, *Mayor*
JOHN J. FITZGERALD, *Director of Redevelopment,* Chester Redevelopment Authority
†JAMES H. GORBEY, *Former Mayor*
†CLEMENT J. McGOVERN, JR., *Treasurer*

*City of Philadelphia

JAMES H. J. TATE, *Mayor*
DAVID M. SMALLWOOD, *Commissioner of Streets*

Bucks County

FRANKLIN C. WOOD, *Executive Director,* Bucks County Planning Commission

Chester County

JOSEPH S. MUNSHOWER, *Executive Secretary,* Chester County Planning Commission

Delaware County

JOHN W. HARPER, *Realtor*
†DANIEL B. ALTMAN, *Assistant Secretary of Defense*
FRANK K. REMY, *County Engineer*

*Montgomery County

ELKINS WETHERILL, *President,* Philadelphia-Baltimore–Washington Stock Exchange
ARTHUR F. LOEBEN, *Director,* Montgomery County Planning Commission

*New Jersey Department of Transportation

DAVID J. GOLDBERG, *Commissioner of Transportation*
KEITH M. ROSSER, *Director of Planning*

*New Jersey Department of Community Affairs

PAUL N. YLVISAKER, *Commissioner of Community Affairs*
B. BUDD CHAVOOSHIAN, *Assistant Commissioner*

*New Jersey Governor's Appointee

STANLEY C. VAN NESS, *Counsel to the Governor*

*City of Camden

ALFRED R. PIERCE, *Mayor*
WILLARD COOPER, *Coordinator,* Office of Planning and Renewal

City of Trenton

CARMEN J. ARMENTI, *Mayor*
CHARLES C. NATHANSON, *Director of Planning and Development*

Burlington County

ANTHONY T. GRESKI, *Freeholder*
BERNARD CEDAR, *Director,* Burlington County Planning Board

Camden County

PAUL R. ANAPOL, *Freeholder*
JOHN D. TOMASELLI, *Planning Director,* Camden County Planning Board
††PETER DEL GRANDE, *Freeholder*

*Gloucester County

JAMES M. TURNER, *Freeholder*
JOHN H. FISHER, III, *Director,* Gloucester County Planning Department

Mercer County

CHARLES KOVACS, *Freeholder*
LEO LAAKSONEN, *County Planning Engineer,* Mercer County Planning Board
†FRANK J. BLACK, *Freeholder*
†LOUIS A. CALVANELLI, *County Planning Engineer*

NON-VOTING MEMBERS AND ALTERNATES

U. S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads

*Pennsylvania Division

GEORGE F. FENTON, *Division Engineer*
ROGER E. BORG, *Planning and Research Engineer*
†CHARLES M. GERDES, *Planning and Research Engineer*

*New Jersey Division

ROBERT I. KELLUM, *Division Engineer*
WILLIAM SCHMITT, JR., *Planning and Research Engineer*

U. S. Department of Housing and Urban Development
*Region II

WILLIAM L. KAPLAN, *Regional Director of Planning*
MICHAEL J. STOMACKIN, *Urban Planner*, Planning Branch

Counsel for the Commission

REYNOLD J. KOSEK, Esq., *Assistant Attorney General and Special Counsel for Research,* Pennsylvania Department of Highways

Executive Director
WALTER K. JOHNSON

Deputy Director
DAVID B. KLOTZ

*Members of Executive Committee, 1968–69
**The Alternate Member is the second man listed under each government or agency
†Former Member
††Treasurer, July-December, 1968

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION

Penn Square Building, 1317 Filbert Street
Philadelphia, Pennsylvania 19107

Lithography: ALLEN, LANE & SCOTT
Typography: NORTH AMERICAN COMPOSITION COMPANY
Design and Art Direction: DAVID LAMONT
Editorial Direction: PETER S. ROBINSON